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SWATERRESOURCES ABSTRACTS



VOLUME 6, NUMBER 3 FEBRUARY 1, 1973

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior



VOLUME 6, NUMBER 3 FEBRUARY 1, 1973

W73-01296-W73-01950

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCU-MENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established disciplineoriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Rioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

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Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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 Includes the following Groups: Properties; Aqueous Solutions and
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- 02 WATER CYCLE
 Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.
- WATER SUPPLY AUGMENTATION AND CONSERVATION Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.
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- WATER QUALITY MANAGEMENT AND PROTECTION Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

THE STRUCTURE OF LIQUID WATER, Leicester Univ. (England). Dept. of Chemistry. M. C. R. Symons. Nature, Vol 239, No 5370, p 257-259, September 29, 1972. 3 fig, 14 ref.

Descriptors: *Water structure, *Hydrogen bond-ing, *Molecular structure, Reviews, Analytical techniques, Water chemistry, Water properties, Investigations, Polarity, Non-polarity.

Investigations, Polarity, Non-polarity.

Most liquid water models that have been described for designed to reproduce selected properties of liquid water, such as its temperature of maximum density or its X-ray scattering pattern. Almost all such models can be contrived to fit these facts. Quantum mechanical calculations for the monomer and dimer are now available and can be trusted to give a fair description of their structures. It seems that the conventional view of the molecule as a near-tetrahedral configuration involving two hydrogen atoms and two noebonding techniques is reasonable, and that the preferred dimer structure is likely to be linear. In the various crystalline iccs, water molecules are strongly hydrogen bonded to four neighbors, and most theories for the liquid are based upon the idea that much of the structure is retained. As monomeric molecules appear in the gas phase it is reasonable hydrogen bonded to less than four neighbors. (Woodard-USGS)

1B. Aqueous Solutions and Suspensions

MOTIONS OF MOLECULES IN LIQUIDS: VISCOSITY AND DIFFUSIVITY, California Univ., Berkeley. Dept. of Chemistry. J. H. Hildebrand. Science, Vol 174, No 4008, p 490-493, October 29, 1971. 4 fig, 3 tab, 14 ref.

Descriptors: *Diffusion, *Liquids, *Viscosity, *Flow, Molecular structure, Fluid mechanics, Bvaluation, Viscous flow, Theoretical analysis, Solutes, Solvents. Identifiers: *Plastic flow, Solute-solvent relation-

The diffusion problem is approached by way of viscosity with special attention to basic distinction between liquid and plastic flow. Reference is made to reports of earlier researchers, such as Batschinski (1913), who published on transport phenomena but whose papers are little known. Batschinski's formulation is discussed and a modification of it is described. Fluidity of a simple liquid is proportional to its degree of expansion over volume, at which its molecules are so crowded as to inhibit self-diffusion and viscous flow. Equations are given to determine values of various liquids. Liquids can be moderately fluid when expanded by less than 10%, which shows the unreality of some theoretical treatments of the liquid state. Diffusivity begins from the temperature at which V equals Vo and can be correlated for temperature dependence, and for solute-solvent interrelations. (Lang-USGS)

INTERMOLECULAR FORCES IN SYSTEMS CONTAINING WATER, California Univ., Berkeley. For primary bibliographic entry see Field 03A. W73-01683

INVESTIGATION OF THE MASS TRANSFER PROPERTIES OF SALINE WATER SYSTEMS, Philoc Corp., Newport Beach, Calif. For primary bibliographic entry see Field 03A. W73-01691

DIFFUSION OF ELECTROLYTES: PRINCIPLES AND PRACTICE OF THE DIAPHRAGM DIFFU-SION TECHNIQUE, Reasseler Polytechnic Inst., Troy, N.Y. For primary bibliographic entry see Field 03A.

MECHANISM OF BOULE FLOTATION ON WATER AND OTHER LIQUIDS, Rochester Institute of Tech., N.Y. For primary bibliographic entry see Field 03A.

02. WATER CYCLE

2A. General

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
For primary bibliographic entry see Field 06E.
W73-01307

REPRESENTATIONS OF RAINFALL AND RU-NOFF BY THE DESCENDING EXPONENTIAL, Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 07C. W73-01321

PREDICTION OF RUNOFF AND EROSION FROM NATURAL RAINFALL USING A RAIN-FALL SIMULATOR, Agricultural Research Service, Morris, Minn. North Central Soil Conservation Research Center. For primary bibliographic entry see Field 02J. W73-01494

ELEMENTS OF THE WATER BALANCE IN THE GEORGIAN SSR (STRUKTURY VOD-NOGO BALANSA OBLASTEY GRUZII), Akademiya Nauk Gruzinskoi SSR, Tiflis. Institut Geografii. L. A. Vladimirov.

Akademiya Nauk SSSR Izvestiya, Seriya Geograficheskaya, No 4, p 89-94, July-August 1972. 1 fig, 1 tab, 8 ref.

Descriptors: *Water balance, *Precipitation (Atmospheric), *Evaporation, *Soil moisture, *Runoff, Surface runoff, Subsurface runoff, Runoff coefficient, Topography, Orography, Mountains, Elevation. Identifiers: USSR, *Georgian SSR, *Caucasus.

Elements of the water balance for low (<1,000 m), medium (1,000-2,000 m), and high (>2,000 m) mountain elevations in different regions of the Georgian Republic are investigated. The water-balance elements tabulated include precipitation, total runoff, surface runoff, evaporation, subsurface runoff, and total soil moisture. Water-balance conditions are most favorable in the western part of the southern slope of the central Caucasus. The most favorable water-balance conditions for each region and for the republic as a whole occur at mountain elevations ranging from 1,000 m to 2,000 m. (Josefson-USGS) W73-01522

SOIL AND NUTRIENT LOSSES IN RUNOFF WITH SELECTED CROPPING TREATMENTS ON TROPICAL SOILS, Agricultural Research Service, Watkinsville, Ga.; and Agricultural Research Service, Rio Piedras, Puerto Rico.

Agronomy Journal, Vol 64, No 3, p 391-395, May-June 1972. 6 fig. 4 tab. 11 ref.

Descriptors: "Runoff, "Nutrients, "Soil erosios, "Rainfall-runoff relationships, Nitrogen, Calcium, Potassium, Magnesium, Sulfur, Chlorine, Fertil-izers, Water quality, Soils, Slopes, Infiltration rate, Losses, Farm management, Soil-water-plant relationships, Tobacco, Grasses, On-site in-vestigations, On-site tests. Identifiers: Puerto Rico, Cropping patterns, "Tropical soils, Test results.

Tropical soils, Test results.

Soil and nutrient losses in runoff for selected cropping systems in 3 soils in Puerto Rico were studied using artificial rainfall. Systems tested were: (1) fallow, (2) conventional tobacco, (3) mulch-tilled tobacco, (4) tobacco in grass strips, (5) pangolagrass, and (6) pangolagrass with above-ground parts removed. Slopes ranged from 26 to 46%; plots were 10.7 m long. Infiltration rates differed from 0.9 to 6.2 cm/hr for soils tested. All soils were resistant to erosion because of a high degree of aggregation and growth of grass in previous yrs. Tillage increased storage capacity and reduced runoff. The amount of nitrogen, potassium, calcium, magnesium, sulfur, and chlorine in the runoff were measured from tilled tobacco during one storm. Plots were treated with fertilizes in runoff are discussed. Graphs showing variations in runoff with time as well as chemical concentrations and tables giving rainfall, runoff, erosion, and nutrient concentrations are presented. (USBR) W73-01790 W73-01790

2B. Precipitation

ILLINOIS RADAR RESEARCH FOR HAIL SUP-PRESSION APPLICATIONS, 1967-1969, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 07B. W73-01300

SMALL-SCALE ATMOSPHERIC MODIFICA-

TION.

Army Materiel Concepts Agency, Alexandria, Va.
For primary bibliographic entry see Field 03B.

W73-01335

BIOCLIMATIC STUDY OF THE CANARY ARCHIPELAGO, (IN FRENCH), Office de la Recherche Scientifique et Technique Outre-Mer, Cayenne (French Guiana). Centre ORSTOM de Cayenne.

Cah O.R.S.T.O.M. (Off Rech Sci Tech Outre-Mer) Ser Biol. 15, 29-60. Illus. Map. 1971. English and

Spanish sammary.
Identifiers: *Canary archipelago, *Climatic studies, Physionomy, Rainfall, Temperature, Vegeta-

The climate of the Canary Islands is dealt with on a series of decreasing scales (macroclimate, local climate, microclimate) and has been correlated with its biological consequences (vegetational physionomy). The Canarian macroclimate, with little or no rain falling in autumn and winter and a high annual mean temperature showing a small range, can be placed in the context of the Mediterranean, or exceptionally the desert, one. A detailed study of the expressions combining temperature and rainfall (pluviothermal quotient of Emberger,

Group 2B—Precipitation

water balance calculated with Thornthwaite's formulas) shows an insignificant rainy season, a high water deficit and the constant warm-winter character of the insular coast climate. Other climatic factors (pressure and wind-dominance of the N-E trade wind, humidity of the air, day length, marine currents) are briefly explained. A comparison of different Macronesian archipelagos shows, that only the Cape Verde one belongs to the tropical zone; the others (Canary Islands, Madeira, Azores) all have a climate of the Mediterranean type. Local climates mainly depend on exposure (trade winds) and altitude. Both up from and down from the cloud layer prevailing at the north side of the mountainous islands one finds a gradient of decreasing precipitation resulting in a remarkable stratification of the vegetational types. In a short paragraph on microclimates, 2 precise examples deal with problems associated with biologic associations and equilibriums of environment and vegetation. Lastly, certain transitional characters suggest that the Canarian climate is situated at the edge of the tropical zone.—Copyright 1972, Biological Abstracts, Inc. W73-01370

MICRO-CLIMATE AND EROSION PROCESSES IN THE SOUTHERN ALPS, NEW ZEALAND, Canterbury Univ., Christchurch (New Zealand) For primary bibliographic entry see Field 02J. W73-01483

THE EFFECTS OF WATER BODIES ON AIR TEMPERATURE AND HUMIDITY DURING THE PERIOD PRECEDING THEIR FREEZING OR OPENING, For primary bibliographic entry see Field 02H. W73-01511

INFLUENCE ON THE UPPER NIAGARA RIVER ICE BOOM ON THE CLIMATE OF BUFFALO.

NEW YORK, State Univ., Coll., Buffalo, N.Y. Great Lakes Lab. J. Hassan, and R. Sweeney. Special Report No 13 for the International Joint Commission, March 1972. 33 p. 12 fig, 10 tab, 9

Descriptors: "Meteorology, "New York, "Climates, Weather patterns, Water temperature, Air temperature, Lake Erie, Structures, Statistical methods, Air pollution, Ice. Identifiers: "Niagara River, "Ice boom, "Buffalo (N.Y.) Air investions."

(N.Y.), Air inversions.

Possible impact of the Lake Erie ice boom at the head of the Niagara River on climate and air pollution of the Greater Buffalo area was studied. Information was supplied by the Canadian Atmospheric Environmental Service, U.S. Weather Service, U.S. Coast Guard, and U.S. Army Corps of Engineers. Statistical methods using matched pair analyses indicated that there had been no significant differences in the water temperatures, measured at the Buffalo and Tonowanda Water Treatment Plant intakes March through June nor in Buffalo's air temperature in the seven years prior to and after the boom was installed in 1964. There was a direct, positive correlation between average daily temperatures at Buffalo, Fredonia and Watertown. The unusual temperature conditions in the 1971 spring were not due to the ice and Watertown. The unusual temperature condi-tions in the 1971 spring were not due to the ice boom; ice persistence was due to many natural factors including colder than average January tem-peratures, more extensive cloud and snow cover, and other conditions. No evidence exists that per-sistence of ice in the lake was due to the ice boom. There is no statistical correlation between date when ice disappeared from Lake Erie and date the boom was removed. The almost constant air inver-sion over Buffalo is the contributing factor to air pollution. (Jones-Wisconsin) W73.01612. W73-01612

CONTRIBUTION OF SCAVENGED SULFUR DIOXIDE TO THE SULFATE CONTENT OF RAIN WATER, Pennsylvania State Univ., University Park. Dept. of Meteorology.

For primary bibliographic entry see Field 05B.

THE VARIABILITY OF WATER VAPOR IN THE STRATOSPHERE, Naval Research Lab., Washington, D.C. H. J. Mastenbrook. Journal of Atmospheric Sciences, Vol 28, No 8, p 1495-1501, November 1971. 1 tab, 3 fig, 14 ref.

Descriptors: "Water vapor, "Climatology, "At-mosphere, "Atmospheric physics, "Hydrologic cycle, "Meteorological data, Climatic data, Cy-cles, Meteorology, Hydrologic aspects, Data col-lections, Hydrodynamics, Hydrologic systems, Stations.

Monthly measurements of stratospheric water Monthly measurements of stratospheric water vapor concentration gathered by a site near Washington, D.C., now constitute a six-year time series of homogeneous data which may be examined for evidence of stratospheric water vapor variability. A regression analysis was performed for six pressure levels (100-40 mb) to examine the variability of water vapor concentration in terms of two components; a linear trend and an annual cycle. A highly significant trend of increasing mixing ratio from 2 to 3 ppm is found for all pressure levels over the six-year interval. A significant annual cycle is indicated for the higher pressure levels. Study of the literature indicates that similar severs. Study of the literature indicates that similar annual cycles and trends have been observed in the height of the tropical tropopause and in temperatures at or near the tropopause. It is suggested that variability in the drying potential of the tropical tropopause region leads to corresponding variability in stratospheric mixing ratio as observed at mid-latitudes. (Black-Arizona)

ON THE VARIATION OF THE SIZE DISTRIBU-ON THE VARIATION OF THE SIZE DISTRIBUTION OF LARGE AND GIANT ATMOSPHERIC PARTICLES AS A FUNCTION OF THE RELATIVE HUMIDITY, Institute for Atmospheric Physics, Budapest

(Hungary). A. Meszaro

Tellus, Vol 23, No 4-5, p 436-440, 1971. 1 tab, 4 fig, 13 ref.

Descriptors: "Meteorology, "Aerosols, "Atmospheric physics, "Chemistry of precipitation, "Nucleation, "Air environment, "Meteorological data, "Formulation, Cloud physics, Precipitation (Atmospheric), Climatology, Humidity, Data collections, Analytical techniques, Condensation.

The investigation of water-soluble substances in are investigation of water-soluble substances in atmospheric aerosols is of interest for many problems in air chemistry, cloud physics, at-mospheric optics and air pollution. It is well known that the water-soluble particles change phase and grow by condensation well below the saturation level, which results in a variation of the saturation levet, which results in a variation of the size distribution as a function of the quantity and chemical nature of hydroscopic materials. Atmospheric aerosol samples captured by a cascade impactor were examined under a microscope at different relative humidities to gain information on the variation of the size distribution of large and giant particles as a function of the relative humidi-ty. There is a seasonal difference in particle growth. Data from ten samplings are presented and discussed. (Black-Arizona) W73-01769

2C. Snow, Ice, and Frost

PRESSION APPLICATIONS, 1967-1969, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 07B. W73-01300 ILLINOIS RADAR RESEARCH FOR HAIL SUP-

BREAKAGE OF FLOATING ICE BY COM-PRESSED GAS BLASTING, Cold Regions Research and Engineering Lab, Hanover, N.H. For primary bibliographic entry see Field 04A. W73-01460

AEROLIAN DEPOSITS OF CLAY SAND, Manitoba Univ., Winnipeg. Dept. of Earth Sciences.
J. T. Teller.
Journal of Sedimentary Petrology, Vol 42, No 3, p 684-686, September 1972. 4 fig. 1 tab, 4 ref.

Descriptors: "Wind erosion, "Aeolian soils, "Clays, "Snow cover, Vegetation effects, Snow, Ripple marks, Sediment transport, Loess, Dust storms, "Canada.

Wind erosion of graular clay soils in fallow fields occurs during the winter months in southern Manitoba. The eroded clay grains first accumulate in and on snowdrifts and are later left as elongate low ridges of sand-sized aggregates of clay particles. Although these clay aggregates may eventually break down and form a uniform clay deposit, they remained as distinct aggregates throughout the summer following deposition. Such deposits may be formed in the glacial or periglacial environment or adjacent to areas such as floodplains, dry lagoons, or dry lake plains where clayrich materials are subjected to fragmentation but are not stabilized by vegetation. (Knapp-USGS) W73-01464

GLACIER SURVEYS BY DISTRICT PERSON-NEL OF THE WATER SURVEY OF CANADA: 2 PEYTO GLACIER, Department of the Environment, Ottawa, (On-tario), Inland Waters Branch.

C. S. L. Ommanney. Glacier Inventory Note No 7, June 1972. 20 p, 8

Descriptors: *Glaciers, *Movement, *Canada, *Water balance, Water yield, Surveys, Water resources, Data collections, Hydrologic data, Discharge (Water).

Identifiers: *Peyto Glacier (Canada).

Surveys were carried out on Peyto Glacier, Alberta, Canada. A condensation is presented of all the information contained in the reports of the Dominion Water and Power Bureau for the years 1945 to 1962. All information on the snout survey, the movement survey and any discharge measure-ments are included. The complete survey results are shown. The diagram section contains a listing ments are included. The complete survey results are shown. The diagram section contains a listing of the snout surveys for each year. Peyto Glacier is located on the eastern side of the Continental Divide, which separates British Columbia and Alberta, in the Wapta Icefield some 37 km northwest of Lake Louise, Alberta. In the south, southwest and northwest three basins form an accumulation area, 9.84 sq km, which drops from 3100 m to a broad glacier tongue. This glacier tongue flows over a bedrock riegel marked by two icefalls, to the northeast to form a small, compound basin. over a bedrock riegel marked by two icefalls, to the northeast to form a small, compound basin, valley glacier which terminates about 2100 m above sea level. The ablation area, 3.51 sq km, has two narrow medial moraine bands. The total area of Peyto Glacier amounts to some 66% of the total basin area. (Knapp-USGS) W73-01473 SOME ARCTIC COASTAL FEATURES AROUND FOXE BASIN AND IN E. BAFFIN ISLAND, N.W.T. CANADA. Nottingham Univ. (England). Dept. of Geography. C. A. M. King. Geografiska Annaler, Vol 51A, No 4, p 207-218, 1969. 8 fig. 2 ub, 11 ref.

Descriptors: *Beaches, *Arctic, *Lee cover, *Surf, Sea level, Sedimentary structures, Sedimentology, Geomorphology, Dunes. Identifiers: Baffin Island (Canada).

Many Arctic beaches are characterized by low energy wave conditions and a falling sea level. Raised coastal features in west Baffin Island include beach ridges of fairly well-rounded stones compared with the dunes of the modern beach. Foley Island, off west Baffin Island in Foxe Basin, has two main series of beach ridges, with height ranges from 93 m to 68 m and 65 m to 41 m, and time periods of 6,800 to 5,600 B.P. and 5,500 to 4,800 B.P., respectively. A hiatus between the two series, when sea level stood between 65 and 70 m, allowed a complex fan pattern of ridges to form. The modern sand beach was surveyed before and after ice breakup. Some of the beach features and sediment characteristics of the east coast of Baffin Island are compared with those of the west coast. The more vigorous wave environment on the east allows greater wave effectiveness in rounding and sorting beach material. (Knapp-USGS)

STUDIES OF THE GLACIAL HISTORY OF HOPEN (HOPEN ISLAND), SVALBARD, Stockholm Univ. (Sweden). Dept. of Physical Geography.
G. Hoppe, V. Schytt, A. Haggblom, and H. Osterholm.
Geografiska Annaler, Vol 51A, No 4, p 185-192, 1969. 5 fig, 1 tab, 15 ref.

Descriptors: "Glaciation, "Pleistocene Boock, "Europe, "Arctic, Sea level, Geomorphology, Topography, Paleoclimatology. Identifiers: Hopen Island (Svalbard).

Studies of roches moutonnees, glacial striae and raised shorelines show that Hopen was covered by a thick Pleistocene ice sheet which, at least at one stage, moved out from an area NE of the island. In contrast to the conditions on Vestspitsbergen and Nordaustlandet the land upheaval on Hopen has, during the last 10,000 years, proceeded at a fairly constant rate, and it seems to be going on. (Knapp-USGS)
W73-01477

SNOWPATCHES: THEIR INFLUENCE ON MOUNTAIN WALL TEMPERATURES AND THE GEOMORPHIC IMPLICATIONS, Calgary Univ., Alberta. Dept. of Geography.

J. Gardner.
Geografiska Annaler, Vol 51A, No 3, p 114-120, 1969, 3 fig. 15 ref.

Descriptors: *Snow cover, *Mountains, *Weathering, *Frost action, *Microenvironment, Geomorphology, Freezing, Thawing, Erosion, Canada, Temperature, Talus, Weather. Identifiers: *Lake Louise.

Temperature data from two snowpatches in the Canadian Rocky Mountains are discussed with respect to their geomorphological significance. The presence of snowpatches influences mountain wall temperature conditions to the extent that diurnal freezing and thawing occurs occasionally. Shattered bedrock on the mountain walls indicates that active physical weathering has occurred. An under-cutting or notch at the break in slope between the mountain wall and a talus accumulation indicates that the weathering is most concentrated in this location. This break in slope is often the site of late-lying snowpatches. The shattered

bedrock, the notch and the temperature data suggest that the presence of snowpatches is of considerable geomorphic significance in the high mountain environment. (Knapp-USGS) W73-01479

FIRN-ICE RELATIONSHIPS, SANDY GLACIER, SOUTHERN VICTORIA LAND, ANTARCTICA, Kansas Univ., Manhattan. Dept. of Geology. W. Dort, Jr., E. F. Roots, and E. Derbyshire. Geografiska Annaler, Vol 51A, No 3, p 104-111, 1969. 7 fig, 1 tab, 1 ref. NSF Grants GA203 and Ga688.

Descriptors: *Glaciers, *Firn, *Ice, *Antarctic, *Sedimentation, *Dusts, Stratigraphy, Sands, Regimen, Glacial drift, Alluvium, Winds, Aeolian soils, Climatology.

Identifiers: *Sandy Glacier (Antarctica).

Sandy Glacier, Antarctica, occupies the head of a 3 km by 1 km cirque valley, and is composed of a unique alternation of ice layers and sand layers. The sand was apparently brought by occasional very strong winds from Onyx River outwash 5 km away and 1,200 m lower. Pits dug in the accumulation zone revealed 115-210 cm of firn and sand layers directly overlying glacier ice that also contains sand layers. Not long ago there was no cofer of firn on any part of this glacier. Accumulation recommenced 2-3 decades before the present. (K-napp-USGS)

PALSA LOCALITIES IN PADJELANTA NA-TIONAL PARK, SWEDISH LAPPLAND, Ohio State Univ., Columbus. Dept. of Geology. S. E. White, G. M. Clark, and A. Rapp. Geografiska Annaler, Vol 51A, No 3, p 97-103, 1969. 6 fig, 13 ref.

Descriptors: "Permafrost, "Arctic, "Tundra, "Bogs, Peat, Frost heaving, Ice, Freezing, Geomorphology, Soil mechanics, Swamps, Frozen ground, Frozen soils.

Identifiers: "Palsas.

Seven bogs adjacent to Puolejokk in Padjelanta, Swedish Lappland, contain palsas either in groups as low winding ridges, or as large isolated oval-shaped husmocks well above the surface of the bogs. In mid-summer 1963, trenches 2 m long and 30 cm wide, were excavated across several palsas in each of the four largest bogs. The thawed dark brown to dark reddish brown peat of each palsa rested on a frozen core of gray sand or of till. Permanently frozen ground exists under better drained nonsorted polygon areas nearby, indicating a climate conducive for palsa maintenance, although the larger palsas may have reached a growth stage such that any slight disturbance might produce deterioration. Alternatively, larger undisturbed palsas may be collapsing in the wetter bogs due to water level changes. (Knapp-USGS) W73-01481

FURTHER OBSERVATIONS ON THE GLACKERS OF THE RUWENZORI, University Coll., Dar es Salaam (Tanzania). P. H. Temple. Geografiska Annaler, Vol 50A, No 3, p 136-150, 1968. 11 fig., 5 tab, 26 ref.

Descriptors: *Glaciers, *Water balance, *Regimen, *Africa, Ablation, Melting, Water yield, Mountains, Alpine, Geomorphology, Glaciology, Climatology, Data collections. Identifiers: *Ruwenzori Mountains (Uganda).

Observations on the behavior of 4 of the main glaciers on the Uganda slopes of the Ruwenzori Range, Uganda are reported. The glaciers examined were relatively active valley tongues. Due

to the amaliness and steepness of the glaciers examined, they probably react rapidly to mass-budget changes. Over the period of observations rapid retreat is evident; this was neither constant nor continuous. In the short run, recession may reflect change in solid precipitation supply but a rise in temperatures seems a more likely cause for long-term recession. (Knapp-USGS) W73-01482

GLACNO-HYDROLOGY, DISCHARGE AND SEDIMENT TRANSPORT IN THE DECADE GLACIER AREA, BAFFIN ISLAND, N.W.T., Stockholm Univ. (Sweden). Dept. of Physical Geography. G. Ostrem, C. W. Bridge, and W. F. Rannie. Geografiska Annaler, Vol 49A, No 2-4, p 268-282, 1967.9 fg. 2 tab, 25 ref.

Descriptors: *Glaciohydrology, *Sediment load, *Arctic, Glaciers, Cold regions, Canada, Sediment transport, Rainfall-rusoff relationships, Water balance, Regimen, Ablation. Identifiers: *Baffin Island (Canada).

Identifiers: *Baffin Island (Canada).

Mass balance studies were initiated in 1965 on the eastern coast of Baffin Island. Accumulation was 25 cm and ablation was 21 cm; thus the 1965 budget was slightly positive. A close connection was found between rainfall and high discharge peaks in the glacier stream, whereas periods of high air temperature gave only small rise in river discharge. Yearly precipitation is in the order of 430 mm in the catchment area of lungsuin River. The sediment load was measured 2-3 times daily in the Decade River, draining 12.8 sq km of which 8.7 sq km (68%) is glacier-covered. In addition, a more detailed study was made once a week by sampling every 3 hours in a 24-hour period. The sediment transport showed huge variations, from a few kg/day to a maximum of 1,183,000 kg/day. Almost 60% of the total amount of suspended inorganic material moved by the river during the whole observation period moved on the one day of the highest sediment discharge. (Knapp-USGS)

NOTES ON THE FORMATION OF FJORDS AND FJORD-VALLEYS, Bergen Univ. (Norway). Dept. of Geology. H. Holtedahl. Geografiska Annaler, Vol 49A, No 2-4, p 188-203, 1967. 15 fig. 41 ref.

Descriptors: "Fjords, "Potholes, "Erosion, *Scour, "Glaciers, Glaciology, Topography, Geomorphology, Structural geology, Valleys, Coasts, Glaciation. Identifiers: "Norway, "Subglacial stream erosion.

The formation of fjords is discussed in the light of new data, with reference both to bottom topography and to erosional features. The longitudinal profiles of the Hardangerfjord and the Sognefjord (Norway) are related to areas of confluence and divergence. The effect of subglacial fluvial erosion is shown at fjord-valley ends (Fossil), in fjord-valleys (Flam valley) and along the Hardangerfjord. Potholes and other glacio-fluvial erosional forms were formed by subglacial meltwater under hydrostatic pressure. The erosional effect of turbidity currents on the valley sides is believed to be alight. (Knapp-USGS)

POTHOLES IN CONNECTION WITH PLASTIC SCOURING FORMS, Oalo Univ. (Norway). Dept. of Geography. J. Gjessing. Geografiska Annaler, Vol 49A, No 2-4, p 178-187, 1967. 8 fig. 20 ref.

Descriptors: *Glaciers, *Scour, *Erosion, *Potholes, *Geomorphology, Topography, Glaciology, Rheology, Ice, Plasticity.

Field 02-WATER CYCLE

Group 2C-Snow, Ice, and Frost

In lee sides of glaciated topography obliquely orientated to ice movement, potholes, plastic acouring forms, and strise appear together and were developed simultaneously by a scouring substance which flowed due to a 'lee-side effect', caused by subplacial pressure conditions. Lee-side potholes have two parts. The lower part is cut vertically down into the rock, having spiral-formed grooves in the wall, and elongated crescent-like depressions and a crest-like asymmetrical elevation in the bottom. The upper part is half-cylindrical, with a characteristic difference in shape between the proximal and the distal rim. Lee-side potholes were probably developed by a deflection of the scouring material along vertical grooves, in lee of protrusions of the rock surface. An eddy, developing the lower part, must have come into being where the flow bent from a horizontal to a vertical direction. The upper pothole part was developed by the nearly vertical flow, bending in distal direction to join the general flow along the lee side. The scouring substance was fine-grained, homogeneous, viscous or plastic, probably a soaked ground moraine or a mixture of water and ce particles carrying rock material. (Knapp-USGS)

COMPOSITIONAL VARIATIONS OF GASES IN

TEMPERATE GLACIERS,
Bern Univ. (Switzerland). Physikalisches Institut.
R. F. Weiss, P. Bucker, H. Oeschger, and H.

Earth and Planetary Science Letters, Vol 16, No 2, p 178-184, October 1972. 2 fig, 2 tab, 18 ref.

Descriptors: *Ice, *Glaciers, *Gases, *Bubbles, Melt water, Glaciohydrology, Water chemistry, Melting, Sampling, Model studies, Nitrogen, Ar-gon, Carbon dioxide, Oxygen, Freezing, Firn. Identifiers: Dissolved gases.

Identifiers: Dissolved gases.

Concentrations N2, O2, Ar and CO2 in ice from the Aletsch Glacier in the Bernese Alps were measured by gas chromatography. Newly formed ice at the head of the glacier contains N2, O2 and Ar in roughly atmospheric proportions, whereas the CO2 content is about 50 times greater than in air. Samples from the terminus of the glacier are considerably lower in total gas content, and are depleted in Ar and O2 and enriched in N2 with respect to air. The CO2 of this gas is about 100 times greater than in air. Model calculations show that the N2-O2-Ar relationships are explained by the removal of these gases in solution in meltivater. Only a small fraction of the CO2 in the ice is present in bubbles, the remainder being distributed within the ice matrix. Adsorption of atmospheric CO2 probably plays a role in determining the concentrations and distribution of CO2 in glacier ice. (Knapp-USGS)

MEASURING THE CHANGE IN THICKNESS OF THE ANTARCTIC ICE SHEET; Bristol Univ. (England). Dept. of Physics. J. F. Nye, M. V. Berry, and M. E. R. Walford. Nature Physical Science, Vol 240, No 97, p 7-9, November 6, 1972. 2 fig. 7 ref.

Descriptors: *Glaciers, *Sounding, *Depth, *Surveys, *Instrumentation, Radio interference, Radar, Data collections.

A method of measuring the thickness change in ice sheets by radio echo methods is more accurate than the gravity method and is free from some of its difficulties. When a radio echo sounder is placed on the surface of an ice sheet the shape of the echo returning from the bed is determined partly by the shape of the outgoing pulse and partly by the 'roughness' of the bed. As in holography, the system takes a wave from a rough surface, adds a reference signal and explores the spatial variation of the resultant signal but the system also uses pulses for vertical range information. (K-mapp-USGS)

W73-01499

WINTER SURVIVAL OF FECAL INDICATOR BACTERIA IN A SUBARCTIC ALASKAN RIVER,
Environmental Protection Agency, College,
Alaska Alaska Water Lab.
For primary bibliographic entry see Field 05B,
W73-01507

ICE SHELVES OF ANTARCTICA (SHEL'-FOVYYE LEDNIKI ANTARKTIDY), Arkticheskii | Antarkticheskii | Nauchno-Iss-ledovatelskii Institut, Leningrad (USSR). N. I. Barkov.

teoizdat, Leningrad, 1971, 227 p, 378 ref.

Descriptors: "Glaciology, "Glaciers, "Glaciation, "Ice, "Antarctic, Antarctic Ocean, Polar regions, Show cover, Fira, Temperature, Ablation, Melting, Freezing, Geomorphology, Climatology, Meteorology, Exploration.

ploration. Identifiers: *USSR, *Ice shelves, Ross Ice Shelf, Shelf ice, Ice barriers, Glacier mass budget, Glacier er nourishment, Glacier wastage, Glacier runoff, Continental glaciers.

Occurrence, morphology, nourishment, structure, temperature, and movement of Antarctic ice shelves were investigated in detail in 1959-61 by the Fifth Soviet Antarctic Expedition on West, Shackleton, Lazarev, and Novolazarevskiy ice shelves and Pobeda Ice Island. Antarctic ice shelves over an area from 65 deg 40 min South to 85 deg 35 min South, coinciding with the northern edge of Exasperation Ice Shelf and the southern edge of Exasperation Ice Shelf and the southern edge of Ross Ice Shelf. A brief history is given of glaciological investigations together with a classification and morphometric description of ice shelves. A comprehensive bibliography is presented containing both Soviet and non-Soviet references dealing with glacier study and glacier-climate interactions. (Josefson-USGS) W73-01520

NATIONAL HAIL RESEARCH EXPERIMENT (FINAL ENVIRONMENTAL IMPACT STATE-MENT). National Science Foundation, Washington, D.C. For primary bibliographic entry see Field 03B. W73-01580

INFLUENCE ON THE UPPER NIAGARA RIVER ICE BOOM ON THE CLIMATE OF BUFFALO,

NEW YORK, State Univ., Coll., Buffalo, N.Y. Great Lakes Lab. For primary bibliographic entry see Field 02B. W73-01612

VARIATIONS IN QUALITY AND QUANTITY OF SLIMS RIVER WATER, YUKON TERRITO-

RY, Michigan University, Ann Arbor. Dept. of Geography. For primary bibliographic entry see Field 02E. W73-01732

SURFACE DYNAMIC TOPOGRAPHY OF AN-TARCTIC WATERS, Columbia Univ., Palisades, N.Y. Lamont-Doherty Geological Observatory. For primary bibliographic entry see Field 02E. W73-01741

SOME ASPECTS OF THE DYNAMICS OF THE ANTARCTIC CIRCUMPOLAR CURRENT, Long Island Univ., Greenvale, N.Y. Graduate Dept. of Marine Science. For primary bibliographic entry see Field 02E. W73-01742

STATISTICAL ASPECTS OF SEA-ICE RIDGE DESTRIBUTIONS,
Cold Regions Research and Engineering Lab.,
Hamover, N.H.
W. D. Hibler, III, W. F. Weeks, and S. J. Mock. Nanover, N.H.
W. D. Hibler, III, W. F. Weeks, and S. J. Mock.
Journal of Geophysical Research, Vol 77, No 30, p
5954-5970, October 20, 1972. 13 fig, 2 tab, 13 ref.

Descriptors: "Sea ice, "Topography, "Ice, Dis-tribution patterns, Statistical methods, Statistics, Data collections, Arctic. Identifiers: "Pressure ridges (Sea ice).

Identifiers: *Pressure ridges (Sea ice).

A theoretical distribution function for pressureridge sail heights and keel depths is derived from
fundamental assumptions about the randomness
of the ridges. It is shown that the distribution function for ridge spacings (distance between ridges)
can also be predicted from the assumption of spatially random occurrence. The suggested distribution functions are, in form, negative exponentials
of the ridge height (or depth) squared and the ridge
spacing, respectively. Extremely good fits were
achieved to extensive data collected from sonar
profiles of the lower surface of the pack ice and to
laser profiles, as well as visual roughness data
from the upper ice surface. Using these models, it
is possible to completely characterize the ridging,
in a one-dimensional sense, by two parameters:
(N), the mean number of ridges per unit length,
and (h), the mean ridge height (or depth). In addition, there is a linear correlation between (N) and
(h). This suggests that maps showing the distribution of (N) or (h) over an ocean covered with pack
ice can be used to statistically characterize both
the spacing and the height distribution of the
ridges. (Knapp-USGS)

SPATIAL ASPECTS OF PRESSURE RIDGE SPATIAL ASPECTS OF PRESSURE RIDGE STATISTICS, Cold Regions Research and Engineering Lab., Hanover, N.H. S. J. Mock, A. D. Hartwell, and W. D. Hibler, IIL. Journal of Geophysical Research, Vol 77, No 30, p 3945-3953, October 20, 1972. 9 fig. 4 tab., 7 ref.

Descriptors: "Sea ice, "Topography, "Ice, Dis-tribution patterns, Statistical methods, Statistics, Data collections, Arctic. Identifiers: "Pressure ridges (Sea ice).

The spatial aspects of sea ice pressure ridge statistics were examined by a census of all ridges in each of three small areas in the arctic basin. Random orientation of ridges can be rejected at the 0.05 level of significance in each study area. Measurements of ridge spacings generally confirm the usefulness and validity of the probability density function. The estimator varies as a function of direction within the study areas, but a mean value has a linear relation to the ridge density (total length of ridges per unit area). (Knapp-USGS) W73-01746

A STUDY OF THE ROUGHNESS PARAMETERS OF SEA ICE FROM WIND PROFILES, McGill Univ., Montreal (Quebec). Dept. of Physics. M. P. Langleben. Journal of Geophysical Research, Vol 77, No 30, p 5935-5944, October 20, 1972. 11 fig, 2 tab, 17 ref.

Descriptors: *Sea ice, *Roughness (Hydraulic), *Winds, *Roughness coefficient, Drag, Fluid mechanics, Flow resistance, Hydrodynamics, Wind velocity, Wind pressure. Identifiers: *Roughness (Aerodynamic).

Measurements of wind speed at five heights in geometric progression to a maximum of 4 meters were made in the Artic for a 3-week period in the spring of 1971 at the junction of two ice floes of differing surface morphology. About 150, or 30%, of the 1-hour wind profiles conformed to the requirements of conditions of near-neutral stratifi-

Evaporation and Transpiration—Group 2D

cation of the boundary layer. Values of roughness length and of drag coefficient for the wind at the 10-meter level varied with wind direction, depending on whether the wind reached the site after flowing over relatively smooth ice or over rough ice. (Knapp-USGS)

IN SITU CREEP ANALYSIS OF ROOM IN FROZEN SOIL, Colorado State Univ., Fort Collins. Dept. of Civil

Engineering, E. G. Thompson, and F. H. Sayles.
B. G. Thompson, and F. H. Sayles.
Journal of the Soil Mechanics and Foundations
Division, American Society of Civil Engineers,
Vol 96, No SM9, Paper 9202, p 899-915, September 1972, 10 fig, 1 tab, 13 ref, append. NSF
Grant GK-20651.

Descriptors: *Permafrost, *Creep, *Finite element analysis, *Frozen soils, Gravels, Silts, Degrada-tion (Slope), Soil mechanics, Soil physical proper-ties, Soil strength, Soil stability, On-site tests.

Creep displacement measurements of the roof and walls of an underground room in permafrost were analyzed by the finite element method. The in situcreep characteristics of the frozen silt agree closely with those determined by laboratory unconfined compressive creep tests performed on undisturbed samples. The creep rate of frozen Fairbanks silt and frozen gravel from Fox, Alaska, can be considered independent of time and strain. This is in contradiction to creep characteristics found for similar soils with higher unit weight and lower ice contents. (Kanpp-USGS) W73-01751

FACTORS AFFECTING WATER MANAGE-MENT ON THE NORTH SLOPE OF ALASKA, Alaska Univ., College. Inst. of Water Resources. For primary bibliographic entry see Field 04C. W73-01798

ANTARCTIC RESEARCH SERIES, VOL. 16. ANTARCTIC SNOW AND ICE STUDIES II.

American Geophysical Union of the National Academy of Sciences-National Research Council: Washington, D.C., 1971. 412 p. Pr. \$24.00. Identifiers: "Antarctic, "Ice, "Snow, Book series.

Fifteen contributions represent an attempt to compile the remaining results of USA oversnow traverses in Antarctica between 1957-1967. Included are the old and new methods for measuring ice thickness and annual snow accumulation, subjective stratigraphic studies of snow layers, a goophysical methods of measuring ice thickness, a theoretical history of the antarctic ice sheet obtained from observation of glacial sediments, investigations of particulate matter and studies on gravimeter observations on Anvers Island. An extensive number of tables, graphs, plates and seismograms are found throughout as well as a list of references at the end of each paper.—Copyright 1972, Biological Abstracts, Inc.

2D. Evaporation and Transpiration

EXPERIMENTAL HYDROLOGIC INVESTIGA-TIONS AT THE VALDAY FIELD LABORATO-RY (EKSPERIMENTAL'NYYE GIDROLOGICHESKIYE ISSLEDOVANIYA NA VALDAYE).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 198, Leningrad, V. I. Kuznetsov, editor, 1971. 232 p.

Descriptors: "Hydrology, "Investigations, "Laboratory tests, Analytical techniques, Instrumentation, Water balance, Water chemistry, Water quality, Water storage, Groundwater, Moisture availability, Rainfall, Infiltration, Evaporation, Runoff, Soils, Forests, Crops, Pertilizers, Lakes.

Identifiers: "USSR, "Valday Field Laboratory (USSR)."

This collection of 11 papers provides information on evaporation from free-water and soil surfaces and on the techniques used for micromeasurement of evaporation in GGI-3,000 evaporation pans designed by the State Hydrologic Institute. Data are given on moisture availability of crops, water storage in freezing soils, infiltration of water into soil in spring, and retention of rainfall by forest cover. Water-quality characteristics of surface runoff from agricultural land and hydrochemical regime of the Valday and Uzbin lakes in Novgorod Oblast also are examined. (Josefson-USGS) W73-01332

EVAPOTRANSPIRATION FROM SOYBEAN AND SORGHUM FIELDS, Kansas State Univ., Manhattan. Dept. of Agrono-

Lynn J. Brun, Edward T. Kanemasu, and William

Lyoners.
Agron J. 64 (2): 145-148. Illus. 1972.
Identifiers: "Evapotranspiration, Flux, Heat, Index, Leaf, Soil, "Sorghum-M, "Soybean-D, Stomatal resistance, Transpiration.

matal resistance, Transpiration.

The evapotranspiration model, presented by Monteith (1965) and later tested by Black et al. (1970) on a loosely structured snap bean (Phaseolus vulgaris) canopy, was used to separate soil evaporation and transpiration on soybean (Glycine max (L.) Calland) and sorghum (Sorghum bicolor (L.) Pioneer No 846') canopies during the growing season. Soil evaporation was estimated as the net radiation below the crop canopy minus the soil heat flux. Stomatal resistance was determined with the diffusion porometer (Kanemasu et al. 1969). Potential evapotranspiration, soil evaporation, and transpiration rates were determined on an hourly basis. The sum of transpiration and soil evaporation was compared to the lysimetric estimates of evapotranspiration. The model and the lysimeters were in agreement, except under conditions of high atmospheric demand when the model inderestimated actual evapotranspiration. The model showed the proportion of water lost as transpiration was closely correlated to leaf area index (LAI) with transpiration at a pproximately 50% of the total evapotranspiration at a LAI of 2 and as much as 95% at a LAI of 4.—Copyright 1972, Biological Abstracts, Inc.

SALINITY ABOVE A WATER TABLE AS AF-FECTED BY RAINFALL AND IRRIGATION, South Dakota State Univ., Brookings. Water Resources Inst. Resources Ins M. L. Horton.

M. L. Horton.

Available from the National Technical Informa-tion Service as PB-212 931, 33.00 in paper copy, \$0.95 in microfiche. South Dakota Water Resources Institute, Brookings, Completion Re-port, August 1972. 34 p, 15 fig, 2 tab, 5 ref. OWRR-B-004-SDAK (1).

Descriptors: *Evaporation, *Leaching, Lysimeters, *Salinity, Soils, *Water table, Rainfall, Irrigation.

The proximity of a water table to the soil surface supplies water for evaporation and indirectly, controls the rate at which salt can accumulate at the surface. A water table was established at two depths, 60 cm. and 120 cm., in lysimeters made with undisturbed cores of Biotia silt loam. The water table level in the lysimeters was automatically controlled, evaporation rate was measured,

and changes in soil salinity were determined. A cover kept rainfall off the lysimeters and permitted study of salt distribution under separate evaporation and leaching conditions. During the study, lysimeters with a water table of 60 cm. evaporated approximately twice as much water as the lysimeters with a water table at 120 cm. Salt accumulation increased with increasing amount of water evaporated. The level of salinity reached in most lysimeters in the surface soil layer would have seriously decreased seed germination and growth of many plants of agricultural significance. The salts that had accumulated during the study were leached from the surface by sprinkler. Approximately 8 cm. of water was required to adequately leach the salts out of the surface layers. layers. W73-01388

DROUGHT RESISTANCE AND INTERNAL WATER BALANCE OF OAK SEEDLINGS, Forest Service (USDA), Bend, Oreg. Pacific Northwest and Range Experiment Station. For primary bibliographic entry see Field 621. W73-01759

THE EFFECT OF COPPICE CUTTING ON THE WATER BALANCE OF EUCALYPTUS CAMAL-DULENSIS DEHN, Volcani Inst. of Agricultural Research, Bet-Dagan

(Israel)

R. Karscho Isr J Agric Res. Vol 21, No 3, p 115-126. 1971. Il-

Identifiers: *Coppice cutting, Drainage, *Eucalyp-tus-Camaldulensis-D, *Evapotranspiration, Run-Off, *Soil moisture recharge, Transpiration, Water balance.

Off. "Soil moisture recharge, Transpiration, Water balance.

Analysis of the annual rates of soil moisture recharge and depletion confirmed that in a coppice of E. camaldulensis and in a nearby clearing, evapotranspiration depends primarily on soil moisture recharge, with practically all of the incoming water being spent on evapotranspiration. The difference between the yearly evapotranspiration rates of the coppice and of the open plot increased from 30 mm in the first yr to 201 mm in the 4th yr of the coppice rotation. Water loss by run-off or drainage from the coppice decreased with increasing recovery of the forest cover. Linear regressions were calculated between gross and art rainfall in the coppice. Four years after cutting, the interception reached 7.1% of gross rainfall, or less than half of that prior to cutting. In the 4th yr of the coppice rotation, and with a gross rainfall of 563 mm, the hydrological budget of the eucalypt and the clearing was (in mm), respectively: evapotranspiration, 505 and 303; interception, 40 and 0; water loss by run-off or drainage, 51 and 243; and moisture content changes in the root zone, -33 and +17. Beginning in the second yr, evapotranspiration from the coppice during the winter was close to open water evaporation. The annual ratio of evapotranspiration to pan evaporation increased from 0.24 in the first yr to 0.35 in the 4th yr of the rotation; it averaged 0.22 in the clearing. Beginning in the third yr, the hydrological budget of the eucalypt coppice, with the exception of interception, was of the same magnitude as that of the forest prior to cutting. Under conditions of soil moisture recharge by direct rainfall limiting evapotranspiration, the eucalypts did not adversely affect water resources; timber production over 4 yr largely offset the excess water consumption of the coppice.—Copyright 1972, Biological Abstracts, Inc. W73-01860

ENVIRONMENTAL INFLUENCES ON THE LEAF TEMPERATURES OF TWO SOYBEAN VARIETIES GROWN UNDER CONTROLLED IRRIGATION, Iowa State Univ., Ames. Dept. of Agricultural Cli-matology.

Group 2D-Evaporation and Transpiration

For primary bibliographic entry see Field 03F. W73-01874

DRYLAND EVAPORATIVE FLUX IN A SUBHU-MID CLIMATE: III. SOIL WATER IN-MID CLIMATE: III. SULL WALLS PLUENCE, Agricultural Research Service, Temple, Tex. Soil and Water Conservation Research Div. J. T. Ritchie, E. Burnett, and R. C. Henderson. Agron J. Vol 64, No 2, p 168-173. 1972. Illus. Identifiers: Climates, Dryland, Evapotranspiration, Evaporation, Bix, Flow, *Gossypium-D-Sp. Rooting, *Soil water, *Sorghum-Bicolor-M, Transpiration, Unsaturated, Wilting.

Bicolor-M., Transpiration, Unsaturated, Wilting.

The relationship between evaporative rates of field-grown cotton (Gossypium sp.) and grain sorghum (Sorghum bicolor (L.) Moench) and the soil water status for use in predicting evaporation on watersheds was studied. Soil water coatent and soil water matric potential of Houston Black clay were measured throughout complete growing seasons for cotton and grain sorghum concurrently with measurements of the daily evaporation rate. Evaporation rates were independent of the soil water status until soil water was depleted beyond a threshold value. This threshold, termed the lower limit for potential evaporation (LLEO), was reached when approximately 18.2 cm of water had been removed from a soil profile initially wet. Another 6.5 cm of soil water was extracted at a decreasing rate before evaporation practically stopped. Evaporation rates after the LLEO threshold was reached where practically independent of the energy available for evaporation and depended on the rooting distribution and the water movement to the roots. An analysis of the soil water transmission characteristics after the threshold LLEO was reached showed that practically all the water extracted by plant roots was moving from the volume of soil immediately surrounding the roots. The need for growing corps with deep, dense root systems in dryland for maximum utilization of stored soil water is indicated. (See also W73-01884)—Copyright 1972, Biological Abstracts, Inc. Abstracts, Inc. W73-01883

DRYLAND EVAPORATIVE FLUX IN A SUBHU-MID CLIMATE: IV. RELATION TO PLANT WATER STATUS.

Agricultural Research Service, Temple, Tex. Soil and Water Conservation Research Div. J. T. Ritchie, and W. R. Jordan.

J. T. Kitchie, and W. K. Jordan. Aggon J., Vol64, No 2, p 173-176, 1972, Illus. Identifiers: Climates, Dryland, Evapotranspira-tion, "Evaporative flux, Leaf, Moisture, Plants, Soils, Sorghum-Bicolor-M, Transpiration, Water balance," Plant-water status, "Subhumid climates.

balance, "Plant-water status, "Subhumid climates. Seasonal trends in relative water content (RWC) of grain sorghum (Sorghum bicolor (L.) Moench) were measured concurrently with evaporation rates during a prolonged drying cycle in 1969. When the available soil water supply was depleted beyond a critical threshold, called the lower limit for potential evaporation (LLEO), daily evaporation rates began to decline substantially below the level of energy available for evaporation. Before the LLEO threshold was reached, midday leaf RWC values were approximately 0.90. Afterwards, these values declined in proportion to measured decreases in daily evaporation. Early morning RWC values did not decrease significantly until 8 days after evaporation began to decline. Leaf stomatal response to soil water deficit was evident when daylight leaf diffusion resistances changed from 2 sec/cm before the LLEO threshold to about 25 sec/cm 10 days after the threshold was reached. Plant water status can be used in conjunction with measured changes in soil water content to define the amount of soil water extractable by plant roots for a particular crop, soil, and climate between the maximum waterholding capacity of the soil and the LLEO threshold. These critical soil water parameters can

be applied to predicting evaporation in 2 stages: a freely evaporating stage when evaporation is limited by the amount of energy available for evaporation; and a falling rate stage when evaporation declines below the potential rate. An equation is proposed for predicting evaporation in the falling stage as an exponentially decreasing function of time after the LLEO threshold is reached. (See also W73-01883)—Copyright 1972, Biological Abstracts, Inc. W73-01884

2E. Streamflow and Runoff

TEMPERATURE MEASUREMENTS OF GROUND AND WATER SURFACES BY AIR-For primary bibliographic entry see Field 07B. W73-01298

A MATHEMATICAL MODEL PREDICTING TIDAL CURRENT VELOCITIES IN THE STRAIT OF GEORGIA-JUAN DE FUCA STRAIT SYSTEM, Victoria Univ. (British Columbia). Dept of Physics. For primary bibliographic entry see Field 05B. W73-01301

PRINCIPLES AND MEASURING TECHNIQUES OF TURBULENCE CHARACTERISTICS IN OPEN-CHANNEL FLOWS, Geological Survey, Bay St. Louis, Miss. For primary bibliographic entry see Field 08B. W73-01304

SUMMARY OF TURBULENCE DATA FROM RIVERS, CONVEYANCE CHANNELS AND LABORATORY FLUMES, Geological Survey, Bay St. Louis, Miss. For primary bibliographic entry see Field 08B. W73-01305

FLOODS OF AUGUST AND SEPTEMBER 1971

IN NEW JERSEY, Geological Survey, Trenton, N.J. S.J. Stankowski. New Jersey Department of Environmental Protec-tion, Division of Water Resources, Trenton, N.J., Special Report 37, 1972. 329 p, 77 fig. 9 tab, 11 ref.

Descriptors: "Floods, "Flood drainage, "Flood profiles, "Flood data, "New Jersey, Flood plains, Flood peak, Streamflow, Gaging stations, Creststage gages, Peak discharge, Flood control, Hydrologic data, Sedimentation, Flood forecasting, Groundwater, Water levels. Identifiers: "New Jersey floods (1971).

Identifiers: *New Jersey floods (1971).

New Jersey experienced two outstanding floods in August and September 1971. The storm of August 26-28, 1971, produced flooding of unprecedented magnitude in the Elizabeth, Rahway, and Raritan River basins and in tributaries to the Delaware River in south-central and central New Jersey. The September 11-14, 1971, storm produced severe flooding in the Hackensack, Passaic, and Elizabeth River basins. These two outstanding flood events caused the loss of at least 7 lives and direct property damage estimated at more than 140 million dollars. Hydrologic data needed for planning and design to control or lessen damages from future floods are provided. Also included are discussions of the antecedent hydrology and meteorology of the storms; a description of the floods, comparison to previous floods, effects on groundwater levels, sedimentation, and flood frequency; a summary of flood stages and discharges; and detailed information on stage and discharge for August and September 1971. Floodcrest elevations are tabulated for more than 700

sites for the August flood and flood profiles are presented for 36 streams. (Woodard-USGS) W73-01314

PROCEEDINGS MISSISSIPPI RESOURCES CONFERENCE, 1972. For primary bibliographic entry see F

VARIATIONS IN RUNOFF AND SEDIMENT YIELDS OF TWO ADJACENT WATERSHEDS AS INFLUENCED BY HYDROLOGIC AND PHYSICAL CHARACTERISTICS, Agricultural Research Service, Oxford, Miss. Sedimentation Lab. For primary bibliographic entry see Field 02J. W73-01320.

REPRESENTATIONS OF RAINFALL AND RU-NOFF BY THE DESCENDING EXPONENTIAL, Agricultural Research Service, Oxford, Miss. Sedimentation Lab. For primary bibliographic entry see Field 67C. W73-01321

THE APPLICATION OF REMOTE SENSING TECHNIQUES FOR DATA COLLECTION ON THE MISSISSIPPI RIVER, Army Engineer District, Vicksburg, Miss. River Stabilization Branch.
For primary bibliographic entry see Field 07B. W73-01322

HYDROGRAPHIC CHARACTERISTICS OF RIVER BASINS ON THE EUROPEAN USSR (GIDROGRAFICHESKIYE KHARAKTERISTIKI RECHNYKH BASSEYNOV YEVROPEYSKOY TERRITORII SSSR). Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR). For primary bibliographic entry see Field 04A. W73-01326

COPPER AND MANGANESE IN NATURAL WATERS OF THE SALAIR PLAIN AND MOUNTAIN RIDGE (SODERZHANYE MIKROELE-MENTOV MEDI I MARGANTSA V PRIRODNYKH VODAKH PRISALAIRSKOY RAVNINY I SALAIRSKOGO KRYAZHA), Novosibirak Inst. of Agrochemistry and Soil Science (USSR).
For primary bibliographic entry see Field 02K.
W73-01331

WATER RESOURCES INVESTIGATIONS IN TEXAS, 1972. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W73-01336

SYNTHESIS OF HYDROGRAPHS AND WATER SURFACE PROFILES FOR UNSTEADY OPEN CHANNEL FLOW WITH LATERAL INFLOWS, Cornell Univ., Ithaca, N.Y. Dept. of Hydraulic Engineering. For primary bibliographic entry see Field 08B. W73-01358

WATER RESOURCES INVESTIGATIONS IN CONNECTICUT, 1972.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-01461

SELECTED CHARACTERISTICS OF MISSIS-SIPPI STREAMS. PART 3. COASTAL RIVER BASINS, BASINS, Geological Survey, Jackson, Miss.

Streamflow and Runoff—Group 2E

J. M. Bettandorff.
Mississippi Board of Water Commissioners,
Jackson Bulletin 72-2, 1972. 32 p. 3 fig. 2 tab.

Descriptors: "Watersheds (Basins), "Mississippi River basin, "Mississippi, "Physical properties, "Streams, Data collections, Geomorphology, Drainage area, Valleys, Lengths, Elevation, Locating, Identifiers: "Tchoutacabouffa River (Miss), "Biloxi River (Miss), "Jourdan River (Miss), River

The importance of the river basin as a logical geographic unit for estimating streamflow characteristics has produced a need for a compilation of basin characteristics of Mississippi streams. This compilation includes drainage area, river mile, valley leagth, and stream bottom elevation at selected sites of Mississippi Coastal river basins (Tchoutacabouffa, Biloxi, Wolf, and Jourdan Rivers). The purpose and scope is to provide a tabulation, in downstream order, of basin characteristics for use in hydrologic studies such as low-flow and flood-frequency analyses and rainfall-runoff correlations. (Woodard-USGS)

MOTIONS OF MOLECULES IN LIQUIDS: VISCOSITY AND DIFFUSIVITY, California Univ., Berkeley. Dept. of Chemistry. For primary bibliographic entry see Field 01B. W73-01475

PREDICTION OF RUNOFF AND EROSION PROM NATURAL RAINFALL USING A RAINFALL SIMULATOR, Agricultural Research Service, Morris, Minn. North Central Soil Conservation Research Center. For primary bibliographic entry see Field 02J. W73-01494

FIBERGLASS-COATED WOODEN WEIRS FOR RUNOFF MEASUREMENTS,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 08B. W73-01501

HYDROGRAPH ROUTING IN OPEN CHAN-NELS, Minnesota Univ., Minneapolis. For primary bibliographic entry see Field 08B. W73-01503

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 14. PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W73-01505

STUDIES TO DEVELOP AND INVESTIGATE AN INVERSE FORMULATION FOR NUMERICALLY SOLVING THREE-DIMENSIONAL FREE SUFFACE FOTENTIAL FLUID FLOWS, Utah Water Research Lab., Logan. For primary bibliographic entry see Field 08B. W73-01508

CALIBRATION OF PARSHALL FLUMES WITH NON-STANDARD ENTRANCE TRANSITIONS, Utah Water Research Lab., Logan. For primary bibliographic entry see Field 08B. W73-01510

STEADY FLOW PAST AN ISLAND WITH AP-PLICATIONS TO BERMUDA, Massachusetts Inst. of Tech., Cambridge. N. G. Hogg. Geophysical Fluid Dynamics, Vol 4, No 1, p 55-81, September 1972. 9 fig, 9 ref. ONR Nonr 1841 (74) and Nonr 3963 (31).

Descriptors: *Ocean currents, *Steady flow, *Stratified flow, Mathematical models, Islands, Water temperature, Salinity, Ocean circulation, Waves (Water), Atlantic Ocean. Identifiers: *Bermuda.

Identifiers: *Bermuda.

Temperature and salinity data from the vicinity of Bermuda reveal vertical displacements of the isopycnals of over 100 m close to the island. A model based on the steady flow of an inviscid, stratified ocean past a circularly symmetric island on a rotating plane gives good qualitative agreement. The effects of island slope and nonlinearities are accounted for in a perturbation procedure. In an anomalous area over the left slope of the island (looking downstream) large steps were observed in the temperature and salimity profiles. The theoretical flow has a minimum Richardson number in this region. In a quasi-empirical manner it is possible to compute a Richardson number profile from the observed density data. This procedure gives values very close to those needed for instability, suggesting that instabilities promote mixing and the development of the layers. (Knapp-USGS)

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE BRYAN, TEXAS METROPOLITAN AREA, 1970, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 07C. W73-01729

VARIATIONS IN QUALITY AND QUANTITY OF SLIMS RIVER WATER, YUKON TERRITORY, Michigan University, Ann Arbor. Dept. of Geography.
M.L. Bryan.
Canadian Journal of Earth Sciences, Vol 9, No 11, p 1469-1478, November 1972. 3 fig, 6 tab, 25 ref.

Descriptors: "Discharge (Water), "Water quality, "Melt water, "Glaciers, "Canada, Ablation, Movement, Regimen, Water balance, Water yield, Sediment load, Dissolved solids, Water chemistry, Turbidity.

Identifiers: "Kaskawulsh Glacier (Canada), "Slims River.

River.

The Slims River, one of the two outlets draining the Kaskawulsh Głacier of the Icefield Ranges, Yukon Territory, Canada, varies in both quality and quantity of discharge. These variations, studied for several 24 hour periods during the summer of 1970, are reflections of both the diurnal ablation pattern of the Kaskawalsh Głacier and of a shift in the glacial drainage. The shift is caused by ice movements at the glacial terminus. Water quality and quantity were measured at the bridge where the Alaska Highway crosses the Slims River and its delta in Kluane Lake. In addition, several similar measurements were taken on tributary streams entering the Slims River below the glacier terminus. Both et al. Slims River below the glacier terminus. Both sets of measurements show a distinct change during early August; the water quantity decreases by a factor of 3-5 and the water becomes decidedly less fresh. The change in quality is a result of the decrease in the proportion of glacial melt water. The effects these changes in river water may have on sediment regimes in Khanne Lake are briefly discussed. (Knapp-USGS)

W73-01732

USE OF SATELLITE NAVIGATION FOR INDI-CATIONS OF EQUATORIAL SURFACE CUR-RENTS, Scripps Institution of Oceanography, La Jolla, For primary bibliographic entry see Field 07B. W73-01739

SURFACE DYNAMIC TOPOGRAPHY OF AN-TARCTIC WATERS, Columbia Univ., Palisades, N.Y. Lamont-Doherty Geological Observatory, A. L. Gordon, and J. A. T. Bye. Journal of Geophysical Research, Vol 77, No 30, p 5993-5999, October 20, 1972. 5 fig., 1 tab, 21 ref. NSF Grant GV 26230. 23*Ocean circulation, *Anterctic, *Ocean currents, "Water levels, *Mathematical models, Model studies, Winds, Atmospheric pressure, Waves (Water), Seiches, Tidal effects.

The sea surface dynamic-height anomaly relative to the 2500-db level for the antarctic waters is discussed in relation to the Antarctic Circumpolar Current. The width and intensity of the current vary greatly; constrictions occur south of the Campbell pinteau at the Drake Passage (near 145 deg W), although the flow is relatively diffuse over the Southeast and Southwest Pacific basins. The variation of sea surface slope across the Drake Passage is nearly the same as that observed in the tidal records at the opposing constlines. To the lee of the Campbell plateau and 145 deg W are wavelike structures in the dynamic topography suggestive of Rossby waves. (Knapp-USGS) W73-01741

SOME ASPECTS OF THE DYNAMICS OF THE ANTARCTIC CIRCUMPOLAR CURRENT, Long Island Univ., Greenvale, N.Y. Graduate Dept. of Marine Science. M. Devine.

Journal of Geophysical Research, Vol 77, No 30, p 5987-5992, October 20, 1972. 5 fig, 12 ref.

Descriptors: *Ocean circulation, *Antarctic, *Ocean currents, *Water levels, *Mathematical models, Model studies, Winds, Atmospheric pressure, Waves (Water), Seiches, Tidal effects. Identifiers: *Antarctic Circumpolar Current.

Equations of the type used to study the oceanic thermocline are used to construct a frictionless geostrophic model of the Antarctic Circumpolar Current (ACC). The Drake Passage region is modeled as a continuous porous barrier. The results indicate large eastward-directed barotropic and baroclinic flows, and large-scale exchanges of water between the ACC and subtropical gyres to the north. The baroclinicity of the ACC is essential to all aspects of the flow. (Kmapp-USGS) W73-01742

A SUBSURFACE NORTH EQUATORIAL COUNTERCURRENT IN THE EASTERN PACIFIC OCEAN, Scripps Institution of Oceanography, La Jolla, Calif. M. Tsuchiya.

Journal of Geophysical Research, Vol 77, No 30, p 5981-5986, October 20, 1972. 2 fig, 1 tab, 13 ref.

Descriptors: *Ocean currents, *Pacific Ocean, *Ocean circulation, Data collections, Oceanography, Salinity, Water temperature, Thermocline. Identifiers: *North Equatorial countercurrent (Pacific).

In the eastern Pacific Ocean an eastward countercurrent is found in the subsurface layers at 3-6 deg N, just to the south of the North Equatorial countercurrent in the shallower surface layers. Data from the Eastropac expedition (1967-1968) indicate that the subsurface countercurrent is remarkably stable and persists at about the same latitude in all seasons of the year at least between 119 deg W and 98 deg W. At 119 deg W the maximum eastward geostrophic speed is about 30 cm/sec and occurs at 170-180 cl/t of thermosteric

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Group 2E-Streamflow and Runoff

anomaly (actual depth 100-200 meters); the width of the countercurrent is 110-160 km, and the average eastward transport is estimated to be 32 cu km/hr. (Knapp-USGS) W73-01743

SYNOPTIC TIME AND LENGTH SCALES OF MOTION IN THE NORTH EQUATORIAL CUR-RENT SYSTEM OF THE PACIFIC OCEAN, Scripps Institution of Oceanography, La Jolla, Scripps Calif.

Cam.
W. B. White, and M. W. Evans.
Journal of Geophysical Research, Vol 77, No 30, p
5971-5980, October 20, 1972. 5 fig, 7 ref.ONR Contract N00014-69-A-0200-6005.

Descriptors: *Ocean currents, *Water tempera-ture, *Time series analysis, Waves (Water), Tidal effects, Tides, Seiches, Correlation analysis, Data collections, Oceanography, Currents (Water), In-strumentation, Pacific Ocean, Thermocline. Identifiers: *North Equatorial current (Pacific).

In the summer of 1967 two deep-moored buoys measured subsurface temperature data for nearly 2 months in the North Equatorial countercurrent near 119 deg W. Power spectral density functions were calculated from these time series. Most of the variance in temperature of the thermocline occurred near three principal time periods corresponding to the semidiurnal and diurnal tidal motions and to the inertial oscillation. The inertial periodicity is a manifestation in the sensors of the mooring motion induced by horizontal inertial currents. In the spring of 1969 two more buoys were moored near the location of the 1967 stations; the power spectral density functions from the newer power spectral density functions from the newer buoys show approximately the same concentration of variance in temperature as the earlier observaof variance in temperature as the earlier observations did. The cross-correlation function between
the two buoys provided phase information from
which the zonal wavelength of the inertial motion
was calculated to have been approximately 110
km. In all the moored power spectra the inertial
spectral peak was consistently at a frequency significantly higher than the local inertial frequency.
However, drogue measurements obtained during
the 1969 expedition suggest an inertial frequency
substantially closer to the local inertial period. The
frequency shift of the inertial wave as measured in
the moored power spectra was a Doppler shift
caused by the mean flow past the fixed moorings.
(Knapp-USGS)
W73-01744

A STUDY OF THE ROUGHNESS PARAMETERS OF SEA ICE FROM WIND PROFILES, McGill Univ., Montreal (Quebec). Dept. of nary bibliographic entry see Field 02C.

A NONCOHERENT MODEL FOR MICROWAVE EMISSIONS AND BACKSCATTERING FROM THE SEA SURFACE, Kansas Univ., Lawrence. Space Technology Labs. For primary bibliographic entry see Field 07B. W73-01748

STREAM TEMPERATURES IN AN ALPINE AREA, University of Wales Inst. of Science and Tech., Cardiff. Dept. of Civil Engineering. F. A. Johnson.

J Hydrol (Amst), Vol 14, No 3/4, p 322-336, 1971. Illus. Identifiers: *Alpine areas, *New Zealand, Seasonal, *Water temperature.

The phase angles and amplitudes of sine curves fitted to the annual cycle of stream temperatures are used as quantitative indices of the thermal

characteristics of catchments and their associated stream waters. Higher altitudes result in lower temperatures but for streams with similar altitu-dinal ranges those with warmer aspects have higher temperatures. The extent of a forest cover influences temperatures by decreasing seasonal variations.—Copyright 1972, Biological Abstracts, Inc. Inc. W73-01870

2F. Groundwater

DEPTH TO WATER TABLE, HARTFORD NORTH QUADRANGLE, CONNECTICUT, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W73-01312

GROUNDWATER RESOURCES OF SIBERIA AND SOVIET FAR EAST (RESURSY PODZEM-NYKH VOD SIBIRI I DAL'NEGO VOSTOKA), Akademiya Nauk SSSR, Irkutak. Institut Zemnoi Kory. For primary bibliographic entry see Field 04B. W73-01327

HYDROGEOLOGY, HYDROCHEMISTRY, AND GEOTHERMAL STUDIES OF GEOLOGIC STRUCTURES (GIDROGEOLOGIYA, GIDROK-STRUCTURES (GIDROGEOLOGIYA, GIDROK-HIMIYA, GEOTERMIYA GEOLOGICHESKIKH STRUKTUR), Akademiya Navuk BSSR, Minsk. Institut Geok-himii i Geofiziki. G. V. Bogomolov, A. I. Silin-Bekchurin, V. I. Dukhanina, V. V. Panov, and Yu. G. Bogomolov. Izdatel'stvo 'Nauka i Tekhnika', Minsk, 1971. 336

Descriptors: "Hydrogeology, "Water chemistry, "Geothermal studies, "Geologic formations, "Structural geology, Stratigraphy, Geologic history, Hydrodynamics, Thermodynamics, Rocks, Aquifers, Halogens, Water types, Groundwater, Groundwater movement, Groundwater movement, Groundwater basins, Cycles, Maps, Model studies

dies. dies. "USSR, "West Pakistan, "India, "Paleohydrogeology, Paleotectonics, Artesian basins, Depressions (Geologic), Platforms (Geologic), Halogenic deposits, Mineralization.

New hydrogeologic, hydrochemical, and geothermal data are presented on the USSR and Russian Platform in general and on the Pripyat', Brest, and Baltic artesian basins in particular. Hydrodynamic, paleohydrogeologic, and thermodynamic conditions of formation and distribution of groundwater in the USSR and other countries, including West Pakistan and India, are examined together with model techniques for solving problems in groundwater flow. A comprehensive bibliography is presented containing references to the literature of geologic and groundwater conditions in the earth's crust. (losefson-USGS)

COPPER AND MANGANESE IN NATURAL WATERS OF THE SALAIR PLAIN AND MOUNTAIN RIDGE (SODERZHANIYE MIKROELE-MENTOV MEDI I MARGANTSA V PRIRODNYKH VODAKH PRISALAIRSKOV RAVNINY I SALAIRSKOGO KRYAZHA), Novosibirik Inst. of Agrochemistry and Soil Science (USSR). For primary bibliographic entry see Field 02K. W73-01331

WATER RESOURCES INVESTIGATIONS IN TEXAS, 1972. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W73-01336

GEOCHEMICAL CONTROLS OF GROUND-WATER QUALITY, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 02K. W73-01338

THERMAL SPRINGS OF THE WESTERN UNITED STATES.
For primary bibliographic entry see Field 07C.
W73-01439

WATER RESOURCES INVESTIGATIONS IN CONNECTICUT, 1972.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-01461

HYDROGEOLOGIC AND ENGINEERING-GEOLOGIC POSSIBILITIES FOR EMPLOYING THE METHOD OF INDUCED POTENTIALS,
Moscow State Univ. (USSR).
A. A. Ogilvy, and E. N. Kuzmina.
Geophysics, Vol 37, No 5, p 839-861, October 1972. 17 fig, 2 tab, 19 ref.

Descriptors: "Geophysics, "Electrical studies, Exploration, Data collections, Hydrologic data, Hydrogeology, Surveys, Aquifer characteristics, Areal hydrogeology, "Groundwater resources, Particle size, Porosity, Identifiers: "Induced potential.

Identifiers: *Induced potential.

The method of induced potentials may be applied in groundwater and engineering geologic investigations. This phenomenon is associated with the diffusion processes occurring between narrow and wide capillaries and affected by membrane potentials in the presence of clay fractions. Modeling with horizontally layered sections and leases of fresh and saline waters gave data for analyzing polarizability behavior in heterogeneous media. Field investigations were carried out in Central Kazakhstan, the Crimea, Mordovia, Armenia, and the Moscow area. The data obtained show the applicability of this method for determining the depth to groundwaters in sandy-clayey deposits, detecting accumulations of fresh groundwaters, and specifying the position of the interfaces between fresh and saline waters. The IP method significantly supplements the information obtained by conventional methods and is employed in combination with them in borehole logging. (K-napp-USGS) napp-USGS) W73-01500

GEOHYDROLOGIC WELL-LOGGING, Royal Inst. of Tech., Stockholm (Sweden). Dept. of Land Improvement and Drainage. For primary bibliographic entry see Field 04B. W73-01733

CHEMISTRY OF GROUNDWATER IN IGNE-OUS ROCK AT ANGERED, GOTHENBURG, Royal Inst. of Tech., Stockholm (Sweden). Dept. of Land Improvement and Drainage. G. Jacks.

Nordic Hydrology, Vol 3, No 3, p 140-164, 1972. 20 fig. 20 ref.

Descriptors: "Water chemistry, "Groundwater, "Weathering, "Leaching, Water analysis, Water yield, Geochemistry, Hydrogeology, Water circulation, Structural geology, Sampling, Borehole geophysics, Monitoring, Observation wells. Identifiers: "Sweden.

At Angered, north of Gothenburg, Sweden, a large number of wells were drilled in Precambrian gnesises to check groundwater levels during the construction of a new suburb. Within an area of about 5 aq km, 25 wells were drilled to depths of about 90 m. The wells were sampled and analyzed.

The ionic composition is controlled by equilibrium between water and solids. The dominating weathering product is Ca-montmorillouite. Establishing equilibrium takes approximately ten years. On higher ground, equilibrium is far from being reached, and these waters are only a few years old. In lower positions of the terrain, sea water from glacial times is retained. Turn-over time of water is thus in the order of hundreds to thousands of years. The degree of washing out of the salt water is correlated to the transmissibility of the tectonic zones in which the water is found. (Knapp-USGS) (Knapp-USGS)

GROUND WATER INVESTIGATION IN GNEIS-SIAN ROCK, SYSTEMATIC STUDY OF A SMALL AREA, Royal Inst. of Tech., Stockholm (Sweden). Dept. of Land Improvement and Drainage. I. Larsson, T. Lundgren, and Y. Gustafsson. Nordic Hydrology, Vol 3, No 3, p 130-139, 1972. 6 fig, 5 ref.

Descriptors: "Hydrogeology, "Aquifer testing, "Water chemistry, "Exploration, "Borehole geophysics, Areal hydrogeology, Granites, Groundwater resources, Aquifer characteristics, Electrical studies, Structural geology, Water temperature. Identifiers: *Sweden.

A method is given for groundwater prospecting in hard rocks which integrates studies of petrography, tectonics, and groundwater chemistry with well-logging of well diameter, self-potential, electric conductivity, and groundwater temperature. An area investigated with this method is situated in the Central Swedish Lowlands, a depression area in the Archaean rocks of Sweden. The topography is very flat and never exceeds 50 m above sea level. The higher parts are sparsely covered with pine and spruce, while most of the clay areas are cultivated. The rocks of the area belong to the Sveco-Fennian system in the Baltic shield. Gray gneisses of supercrustal facies predominate. Locally, the gneisses are homogenized by potassium metasomatosis and appear as migmatities or more or less grantioid types of rock. The well was pumped for 22 hrs at a total yield of 29 cu m with a drawdown of 30 m. The capacity was stabilized at a discharge of 1350 liters/hr during the test. The inflow of water in the bore hole was concentrated to a depth below 56 m with a total yield of 1750 liters/hr at 56 m. With a pumping intensity equivalent to a drawdown of 62 m, a yield of about 2000 liters/hr may be obtained. (Knapp-USGS)

GROUND WATER IN GRANITE ROCKS AND TECTONIC MODELS, Royal Inst. of Tech., Stockholm (Sweden). Dept. of Land Improvement and Drainage. I. Larsson. Nordic Hydrology, Vol 3, No 3, p 111-129, 1972. 13 fig, 6 ref.

Descriptors: "Hydrogeology, "Granites, "Faults (Geologic), "Fractures (Geologic), Structural geology, Joints (Geologic), Water yield, Aquifer characteristics, Groundwater movement, İnfiltrantifiers: *Sweden.

A systematic study of groundwater in faults and fractures in a granite rock was compared with results of uniaxial mechanical testing of granite results of uniaxial mechanical testing of granite and indicate the plane of deformation syntectonic to the dikes. A collection of the tectonic data from the granite is statistically treated and the tectonic picture of the area fits very well into the deformation plane, indicated by the intrusion. The faults and fractures of the granite are, according to their position in relation to the plane of deformation, hypothetically interpreted as tension and shear faults. The faults in shear position are tight and have very little groundwater. The tension faults are open and of a high yield of groundwater. This hypothesis was tested by core-drilling, test wells, and test pumping. (Knapp-USGS)

HYDROLOGIC BOUNDARY ANALYSIS IN BADALTIC AQUIFERS, Geological Survey of India, Nagpur. Ground Water Div. P. G. Adyalkar, and V. V. S. Mani. Current Science, Vol 41, No 4, p 127-129, February 1972. 1 fig, 2 ref.

Descriptors: *Aquifer characteristics, *Hydrogeology, *Aquifers, *Boundaries (Surfaces), *Area hydrogeology, *Earth-water interfaces, Groundwater, Groundwater recharge, Analytical techniques, Water table, Drawdown, Permeability, Hydraulics, Porosity, Interfaces, Geohydrologic units.

A number of aquifer performance tests on open wells piercing a basaltic water table aquifer were conducted during the course of systematic hydrogeological surveys in the basaltic terrain of Maharashtra, India. The lava flows of the Deccan basalt differ widely with respect to their ability to receive recharge as well as hold water in storage and later transmit it conveniently in the form of groundwater. Groundwater occurs under both water table and confined conditions in the Deccan Lava flows. The development of formulas to compute the aquifer characteristics is based on the fundamental assumption of infinite areal extent of the aquifer. The analysis of boundary effects is of prime importance in the study of aquifer yield, and the aquifer. The analysis of boundary effects is of prime importance in the study of aquifer yield, and identification of such boundaries from the inspection of aquifer test data is possible. Studies show that one can recognize boundary effects in basaltic water table aquifers by the study of straight line graphs as obtained by the Theis recovery method. However, actual distances to the boundaries cannot be determined, as observation wells are very mecessary for such computation. (Black-Arizona) W73-01770

TRANSIENT SEEPAGE FLOW TOWARD TWO TRANSIENT SEEFAGE FLOW TOWARD I WO PARALLEL DRAINS, Wisconsin Univ., Milwaukee. I. Gyuk, and G. M. Karadi. Journal of the Engineering Mechanics Division, American Society of Civil Engineers, Vol 98, No EMI, p 211-266, Feb 1972. 7 fig. 2 ref, 2 append.

Descriptors: "Seepage, "Groundwater flow, Tile drainage, Groundwater movement, Drains, Mathematical analysis, Differential equations, Numerical analysis, Aquifers, Phreatic lines, Agricultural engineering, Laplace equations, Drawdows, Tile drains, Drainage. Identifiers: Conformal mapping, Highway design, Method of images, Transient flow, Drain spacing.

A conformal mapping technique is applied to an analysis of transient seepage flow toward 2 parallel drains in a semi-infinite homogeneous and isotropic aquifer, taking into consideration the monlinear boundary condition on the free surface. The mapping function is expressed as the power function of time and the seepage domain is mapped onto a domain of an auxiliary complex variable so that the free surface will always remain the real axis. The solution is first obtained for a single drain by neglecting the terms of the fourth and higher orders. Then the solution is extended to 2 parallel drains by using the method of images. Calculations are carried out for different ratios of drain depth to drain spacing using several drain diameter to drain depth ratios. (USBR)

2G. Water in Soils

SOLUBILITY CHARACTERISTICS OF ROCKS, SOILS, AND MUD (GORNYYE, POCHVEN-NYYE I ILOVYYE RASTVORY), Akademiya Nauk SSSR, Novosibirsk. Institut Neorganicheskoi Khimii.
P. A. Kryukov.
Ludatel'ato 'Nauka' Sibirskoye Otdeleniye, Novosibirsk, 1971. 220 p.

Descriptors: *Aqueous solutions, *Solubility *Rocks, *Soils, *Mud, Water chemistry, Wate analysis, Electrochemistry, Thermodynamics Physicochemical properties, Chemical properties Gels, Equilibrium, Suspension, Moisture content Comate water, Natural resources, Analytica techniques, Instrumentation, Equipment. Identifiers: *USSR, *Soil solutions.

Solubility characteristics of sedimentary rocks, soils, and mud are examined and instrumental methods applicable to the analysis of water in them are described. Techniques used primarily for obtaining solutions from rocks are described together with physicochemical phenomena associated with precipitation of gels. Results of investigations of water contained in rocks in areas of hydraulic structures and oil and mineral-water deposits are accompanied by a review of methods for examination of water in soils and mud. (Josefson-USGS) W73-01325

TRACE ELEMENTS IN SOILS, PLANTS, AND WATER OF THE SOUTHERN PART OF WESTERN STBERIA (MIKROELEMENTY V POCHVAKH, RASTITEL'NOSTI I VODAKH YUZHNOY CHASTI ZAPADNOY SIBIRI). Novosibirsk Inst. of Agrochemistry and Soil Science (USSR). Por primary bibliographic entry see Field 02K. W75-01329

BORON IN SOILS, PLANTS, AND WATER OF THE KYSHTOVKA RAYON IN MOVOSIBIRSK OBLAST (BOR V POCHVAKH, RASTITEL'-NOSTI I VODAKH KYSHTOVSKOGO RAYONA NOVOSIBIRSKOY OBLASTI), NOVOSIBIRSKOY OBLASTI), NOVOSIBIRSKOY OBLASTI), FOR primary bibliographic entry see Field 02K. W73-01330

EXPERIMENTAL HYDROLOGIC INVESTIGA-TIONS AT THE VALDAY FIELD LABORATO-RY (EKSPERIMENTAL'NYYE GIDROLOGICHESKIYE ISSLEDOVANIYA NA VALDAYE). ALDA I E). Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR). For primary bibliographic entry see Field 02D. W73-01332

TENSIOMETERS AND THEIR APPLICATION TO DETERMINATION OF THE MOISTURE CONTENT OF SOIL AND IRRIGATION DATES, (IN RUSSIAN), K. N. Shishkov, A. A. Okushko, and N. A. Minenthers.

K. N. Shishkov, A. A. Ohushav,
Muromtsev.
Tr Inst Eksp Meteorol Gl Upr Gidrometerorol
Sluzhby 13, p 74-89, 1970.
Identifiers: "Soil moisture, Measurement, Dates,
Hysteresis, Irrigation, Pressure, Soils, Suction,
"Tensiometers.

The possibility of using tensiometers as indicators of the moisture content of soil and of the need for crop irrigations is demonstrated. Data are provided on the effect of soil temperature and capillary hysteresis upon suction pressure. Several formulas are furnished for conversion of the soil suction pressure to its moisture content.—Copyright 1972, Biological Abstracts, Inc.

Field 02-WATER CYCLE

Group 2G-Water in Soils

W73-01376

THE ROLE OF FERTILIZERS IN THE IM-PROVEMENT OF FRODUCTIVITY OF THE ERODED NON-IRRIGATED SOILS OF TADZ-HIKISTAN, (IN RUSSIAN), For primary bibliographic entry see Field 03F. W73-0137.

THE EROSION CONTROL EFFICIENCY OF SYNTHETIC POLYMERS ON IRRIGATED DARK CHESTNUT SOILS IN THE ALMA-ATA OBLAST, (IN RUSSIAN), For primary bibliographic entry see Field 04D. W73-01380

SALINITY ABOVE A WATER TABLE AS AF-FECTED BY RAINFALL AND IRRIGATION, South Dakota State Univ., Brookings. Water Resources Inst. For primary bibliographic entry see Field 02D, W73-01388

INFRARED SPECTROGRAPHY OF THE BITU-MENS EXTRACTED OF CALCIC HYDROMORPHIC SOILS, Poitiers Univ. (France). Faculte des Sciences. For primary bibliographic entry see Field 02K. W73-01392

SEWAGE SLUDGE INCORPORATION IN EX-PERIMENTAL FIELD PLOTS TO EVALUATE HAZARDS AND BENEFITS, AND DEVELOP TECHNIQUES FOR OPTIMIZING BENEFITS AND MINIMIZING HAZARDS (DRAFT EN-VIRONMENTAL STATEMENT). Agricultural Research Service, Washington, D.C. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 05D. W73-01408

DYNAMICS OF NITRATES IN IRRIGATED CALCAREOUS CHERNOZEM (IN RUSSIAN), For primary bibliographic entry see Field 05B. W73-01410

TRANSFORMATION OF MANGANESE IN A WATERLOGGED SOIL AS AFFECTED BY REDOX POTENTIAL AND PH, Louisians State Univ., Baton Rouge. Dept. of Agronomy.

Agronomy.
S. Gotoh, and W. H. Patrick, Jr.
Soil Science Society of America Proceedings, Vol
36, No 5, p 738-742, September-October 1972. 4
fig, 24 ref.

Descriptors: "Manganese, "Soil chemistry,
"Anaerobic conditions, "Oxidation-reduction potential, "Solubility, "Hydrogen ion concentration, Oxidation, Reduction (Chemical), Trace elements, Nutrients, Ion exchange.
Identifiers: "Soil manganese.

The distribution of different forms of manganese in waterlogged soil was studied over a wide range of closely controlled Eh-pH conditions. At pH 5 almost all of soil manganese was converted from the reducible to the water-soluble plus exchangeable fraction even at a redox potential as high as +500 mV. In sharp contrast, at pH levels between 6 and 8 most of the conversion took place at relatively lower redox potentials of +200 to +300 mV. When the water-soluble plus exchangeable fraction was further divided into its two components, low pH and low Eh increased water-soluble manganese at the expense of the exchangeable form. Cation exchange reactions were important in regulating the equilibria between water soluble and exchangeable manganese. Labeled manganese added to the soil showed an almost identical distribution among the various manganese fractions

to that of native soil manganese. The observed pMn/pH slope and Eo were much lower at pH 6 to 8 than those calculated for pure equilibrium systems. The Eh and pH of flooded soils provide general control of manganese transformation, which probably includes both chemical and biological processes. (Knapp-USGS) W73-01493

FIELD MEASUREMENT OF UNSATURATED HYDRAULIC CONDUCTIVITY BY INFILTRATION THROUGH GYPSUM CRUSTS, Wisconsin Geological and Natural History Survey, Madison.

J. Bouma, and J. L. Denning.
Soil Science Society of America Proceedings, Vol 36, No 5, p 846-847, September-October 1972. 2 fig. 3 ref.

Descriptors: *Infiltration, *On-site tests, *Unsaturated flow, *Hydraulic conductivity, Soil water movement, Gypsum, Steady flow. Identifiers: *Soil crusts.

Field trials were made to test the use of gypsum crusts in the crust test method for measuring unsaturated hydraulic conductivity (K) in situ. Crust consisting of mixtures of sand and gypsum were more stable and had more constant hydraulic properties than previously used crusts consisting of various puddled soil materials. Test results of four soil horizons are reported. (Knapp-USGS) W73-01495

THE EFFECT OF BULK DENSITY AND INITIAL WATER CONTENT ON INFILTRATION IN CLAY SOIL SAMPLES, Macdonald Coll., Montreal (Quebec). Dept. of Soil Science.

Science.
P. A. Gumbs, and B. P. Warkentin.
Soil Science Society of America Proceedings, Vol
36, No 5, p 720-724, September-October 1972. 6
fig. 2 tab, 16 ref.

Descriptors: *Infiltration, *Expansive clays, *Expansive soil., *Bulk density, Diffusivity, Moisture content, Clays, Absorption, Adsorption, Soil water moves.cst.

water moves, cat.

Infiltration measurements were made on swelling clay soil samples packed into columns. Small increases in bulk density over the range 1.10 to 1.25 g/cc markedly decreased the rate of water movement. The magnitude of the effect was greater for confined samples than unconfined samples at all initial water contents. A 1-cm compact layer in the profile retarded water movement if the soil was confined. In partially confined samples the soil in the compact layer would swell on wetting, and water movement was retarded only when the bulk density of the remainder of the column. Bulk densities below 1.05 g/cc, and heat of wetting in partially confined samples with 0% initial water content produced nonlinear relationships of distance to wet front vs. square root of time. Under these experimental conditions gravity contributed significantly to water movement at high initial water content. (Knapp-USGS)

THE TRANSPORT OF CATIONS IN SOIL COLUMNS AT DIFFERENT FORE VELOCITIES,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
S-H. Lai, and J. J. Jurinak.
Soil Science Society of America Proceedings, Vol 36, No 5, p 730-733, September-October 1972. 5 fig, 2 tab, 14 ref. FWQA Grant WP-01492-01.

Descriptors: "Ion transport, "Pore water, "Soil water movement, "Ion exchange, Cation exchange, Adsorption, Leaching, Translocation, Clays.

Identifiers: *Cation transport (Soils).

The transport of Na and Mg in Ca-saturated Yolo loam soil column under saturated steady state flow of different pore velocities was studied. The cation solution was maintained at a concentration such that a linear adsorption isotherm described the cation adsorption. Experimental retention curves were compared to the theoretical solutions obtained from a linear equilibrium model. At low relative concentrations, the equilibrium adsorption of Na was significantly less than that of Mg. At high pore velocities, the agreement of the experimental retention curves with that of the theoretical calculation was good. At low pore velocity, the agreement was poor. The retention volumes of Na and Mg were smaller than those theoretically calculated and those obtained experimentally at light pore velocity. Extensive tailing of Mg observed in the experimental data was not described by the theoretical model. (Knapp-USGS) W73-01497

WETTING FRONT INSTABILITY IN LAYERED SOILS, Yale Univ., New Haven, Conn. Dept. of Engineering and Applied Science.
D. E. Hill, and J-Y. Parlange.
Soil Science Society of America Proceedings, Vol. 36, No. 5, p. 697-702., September-October 1972. 4 fig., 2 tab., 17 ref.

Descriptors: "Infiltration, "Soil water movement, "Wetting, "Soil structure, Hydraulic conductivity, Percolation, Seepage, Unsaturated flow, Saturated flow, Recharge, Soil texture. Identifiers: "Wetting front instability.

Identifiers: "Wetting front instability.

Percolation of a one-dimensional wetting front in homogeneous soil is stable, but in a layered soil whose upper layer is finer and less conductive than the coarser layer beneath, the wetting front that the coarser layer beneath, the wetting front successive that the coarser layer beneath, the wetting front processing columns, or "fingers," in which flow is three-dimensional. The instability originates at the interface but takes some time to develop, hence the wetting fingers appear some distance below the interface. The fingers nove downward at a velocity equal to the saturated conductivity divided by the saturated volumetric water content of the bottom layer. The fingers consist of a saturated inner core percolating downward surrounded by an unsaturated outer layer. The width of the fingers is independent of the flow rate and of irregularities at the interface. The number of fingers per unit area of interface is directly proportional to the flow rate. Instability of the wetting front in layered soil following rain or irrigation makes it possible for smaller volumes of water to penetrate deeper than would have been possible had the wetting front remained stable. (Knapp-USGS)

LYSIMETER DESIGNS FOR STUDY OF LEACHING OF SALINE SOILS (KONSTRUKT-SII LIZIMETROV DLYA IZUCHENIYA PRO-MYVOK ZASOLENNYKH POCHY), Vsesoyuznyi Nauchno-Isaledovatel akii Institut Gidrotekhniki i Melioratsii, Moscow (USSR). For primary bibliographic entry see Field 67B. W73-01516

SECONDARY SALINIZATION OF IRRIGATED LAND IN THE VOLGA-DON INTERFLUVE (V-TORICEMOVE ZASOLENIVE OROSHAYZ-MYKE ZEMEL' VOLGO-DONSEOGO MEZE-DURECHYA),
For primary bibliographic entry see Field 03C. W73-0151.

CHEMICAL COMPOSITION OF NATURAL WATERS IN THE VYG RIVER BASIN IN RELA-TION TO THE SOIL OF CENTRAL KARELIA (O KHMICHESKOM SOSTAVE PRIEODNYKH VOD BASSEYNA R. VYG V SVYAZI S POCHVENNYM POKROVOM TSENTRAL'NOY KARELII),

miya Nauk SSSR, Moscow. Pochvennyi In-

I. G. Vazhenin, I. G. Tsyurupa, and Ye. I.

Arsen'yeva. Pochvovedeniye, No 2, p 44-55, February 1972. 9 tab, 28 ref.

Descriptors: "Water chemistry, "Water analysis, "Water sampling, "Surface waters, "Soil chemistry, Soil water, Soil types, Soil horizons, Soil profiles, Forests, Vegetation, Rivers, River basins, Salinity, Salts, Ions, Inorganic compounds, Organic matter, Mineralogy, Seasonal. Identifiers: "USSR, "Karelia, "Vyg River, "Mineralization

*Mineralization.

The results of long-term (1966-70) observations of the chemical composition of river and soil waters in the Vyg River basis in east-central Karelia are examined. The Vyg River, one of the largest in the Republic, is 314 km long. The drainage area is 27,200 sq km, and the average annual runoff volume is 8.05 billion cu m. Average salinity of surface waters of the basin is very low (<50 mg/liter) but is about 1.5 times higher than that found in rivers of northern Karelia and the Kola Peninsula. Calcium bicarbonate is the most concentrated anion in the river waters. Average annual discharge of water-soluble salts into the White Sea is about 500,000 metric tons or about 20 metric tons of salts per sq km of basin area. Soil water entering rivers and lakes of the basin is weakly mineralized, being only slightly more saline than the river waters. Soil water contains somewhat higher concentrations of aluminum and silicon and lower concentrations of aluminum and silicon and lower concentrations of calcium and magnesium. Complex compounds play an important part in the migration of silicon, aluminum, iron, calcium, and magnesium in Karelia, and al-lowance must be made for the complex forms of different elements in balance calculations of dissorbed-ion discharge. (Josefson-USGS) W73-01518

USE OF LATEX AS A SOIL SEALANT TO CONTROL ACID MINE DRAINAGE.
Univoyal, Inc., Wayne, N.J. Research Center.
For primary bibliographic entry see Field 05G.
W73-01594

FIELD BEHAVIOR OF GEZIRA CLAY UNDER IRRIGATION, Cotton Research Corp., Wad Medani (Sudan). H. G. Farbrother.

Cotton Grow Rev. 49 (1): 1-27. Illus. 1972. Identifiers: *Clays, *Gezira clay, Irrigation, *Soil moisture, Soils, Sudan.

A selection of a large amount of data available on the distribution of soil moisture in depth, im-mediately before and after an irrigation, is presented to show what happens under a range of irrigation regimes in 1 particular locality.—Copy-right 1972, Biological Abstracts, Inc. W73-01640

COMPUTER SIMULATION MODEL OF DYNAMIC BIO-PHYSICO-CHEMICAL PROCESSES IN SOILS, Arizona Univ., Tucson. Dept. of Soils, Water and Engineering. Engineering.
For primary bibliographic entry see Field 05B.
W73-01757

ECOLOGICAL EVALUATION OF RODENT FOPULATIONS IN THE DESERT BIOME OF RAJASTHAN, Central Arid Zone Research Inst., Jodhpur (India). For primary bibliographic entry see Field 06A. W73-01758

THE OCCURRENCE OF HIGH CO2 CONCENTRATIONS IN SOIL AIR, Volcani Inst. of Agriculture Research, Bet-Dagan (Israel). Dept. of Soils and Water.
H. Enoch, and S. Dasberg, Geoderma, Vol 6, No 1, p 17-21, 1971. 1 tab, 1 fig,

Descriptors: "Soil chemistry, "Soil chemical properties, "Soil analysis, "Soil texture, "Geochemistry, "Soil environment, "Soil gases, "Chemical analysis, "Uniformity coefficient, "Soil tests, Plant growth regulators, Moisture deficit, Root development, Soil-water-plant relationships, Inhibitors, Soil properties.

A decrease in O2 concentration in the soil air is accompanied by an equivalent increase in CO2 concentration with the concentration of the two gases totaling 21 percent. However, under aerobic conditions the volumetric ratio of CO2 evolved to O2 consumed (respiratory coefficient) is higher than one; furthermore, the absorption coefficients of O2 and CO2 in water are different. Under certain circumstances the sum of O2 and CO2 concentrations could therefore differ considerably from the O2 and CO2 in water are different. Under certain circumstances the sum of O2 and CO2 concentrations could therefore differ considerably from the expected 21 percent, and CO2 concentrations much above the 21 percent could exist. Such concentrations have been shown to influence seed germination and root growth. Hence it is important to know whether such concentrations occur and under what conditions. An investigation of the gaseous composition in soils under conditions where extremes could be anticipated was made. The air composition was measured in soil columns of different textures. Carbon dioxide concentrations exceeding 40 volume percent were found above the capillary fringe in soil columns with stagnating water tables. As the clay content of the soil decreased, the level of maximum CO2 concentrations was found to occur at increasing depth below the surface. The very high CO2 concentrations found are due to the release of CO2 during evaporation of water, the high solubility of CO2 in soil water and the high rate of microbiological activity. (Black-Arizona)

USE OF SOIL SURVEYS IN THE IDENTIFICA-TION OF FLOODPLAINS, Soil Conservation Service, Columbus, Ohio. For primary bibliographic entry see Field 06F. W73-01762

QUALITY OF IRRIGATION WATERS AND THEIR EFFECT ON SOIL PROPERTIES IN RAJASTHAN-A REVIEW, Udaipur Univ. (India). Agricultural Experiment Station. For primary bibliographic entry see Field 03C. W73-01765

PLANT INDICATORS OF ALLUVIAL SOILS OF CENTRAL IRAQ, Baghdad Univ. (Iraq). Coll. of Agriculture. I. I. Chaudhri, H. A. Kareem, A. Al-Zubaidi, and A. Y. Hanna. Vegetatio, Vol 23, No 5-6, p 315-322, November 1971. 4 tab, 4 ref.

Descriptors: "Bioindicators, "Soil analysis, Evaluation, "Soil surveys, "Soil-water-plant rela-tionships, "Soil classification, "Soil types, Biological communities, Vegetation, Terrain analysis, Chemical analysis, Soil chemical proper-ties, Soil chemistry, Soil tests, Plant groupings, Environmental gradient.

Various irrigation and soil reclamation projects in Iraq require rapid, cheap and reasonably accurate methods for evaluation of soil. The use of vegeta-tion for predicting the properties of soil has achieved great importance in recent years. The al-luvial soils of Central Iraq are occupied by four

main vegetation types. Soil samples from different areas under these vegetation types were collected for analysis. The soils under the riparian vegetation are characterized by medium salinity and high proportions of bivalent cations. The soils occupied by arid scrub vegetation have comparatively higher contents of clay and small amounts of soluble salts. The soils of the halophytic vegetation are highly saline and the main component is sodium chloride. The soils under the aquatic vegetation are high in organic matter and low in salinity. (Black-Arizona)
W73-01767

GERMINATION AND YIELD OF BARLEY WHEN GROWN IN A WATER-REPELLENT

Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils. R. D. Bond.

Agronomy Journal, Vol 44, No 3, p 402-403, 1972. 1 tab, 5 ref.

Descriptors: "Soil management, "Barley, "Soil physical properties, "Soil water movement, "Moisture deficit, "Moisture stress, "Soil-water-plant relationships, "Soil chemistry, Infiltration, Germination, Plant physiology, Crop production, Crop response, Cereal crops, Drought tolerance, Water shortage, Soil amendments, Plant growth regulators. Identifiers: *Australia.

Identifiers: *Australia.

When rain falls onto a water-repellent soil, water penetrates through narrow columns while the intervening soil remains dry for long periods during the wet growing season. Uneven penetration of rainwater into water-repellent sands decreases germination of annual plants. The patterns of wet and dry soil found after rain in citrus orchards, forests, and pastures have been described. Similar patterns have now been observed under cereals grown on sandy soils. To assess the importance of this problem, germination and yield of barley (Hordeum vulgare var. prior) were observed at two field sites on water-repellent sands in South Australia. Germination was controlled by the uneven penetration of rainwater into the soil. Late and restricted germination decreased the average yield of grain to only 50 percent of yield from the best plots. Low plant density was also caused by uneven penetration of rainwater which left areas of the seed bed too dry for germination to proceed. Retarded germination appears to be a general phenomenon on water-repellent sands and cereal phenomenon on water-repellent sands and cereal yields from large areas of farm land may be decreased by this effect. (Black-Arizona)

FACTORS IN THE MOLYBDENUM AND PHOSPHORUS STATUS OF SOILS ON THE DORRIGO PLATEAU OF NEW SOUTH WALES, Commonwealth Scientific and Industrial Research Organization, Wembley (Australia). Div. of Plant

Industry.

N. J. Barrow, and K. Spencer.

Aust J Exp Agric Anim Husb. Vol 11, No 53, p 670-676. 1971. Illus.

Identifiers: Adsorption, "Australia, Clover-D, "Molybdesum, New South Wales, "Phosphorus, Plateau, "Soils, "Dorrigo plateau (N.S.W.)Aust.

Samples of 50 virgin surface soils were collected within the 90-220 cm rainfall zone. The parent rocks were granites, sediments, basalt, and trachyte. The soils were used in a pot trial in which tractyte. Ine soits were used in a pot trial in which clover plants were grown with and without added Mo or phosphate. Laboratory measurements were made of the soils' ability to adsorb molybdate and phosphate and of extractable molybdate and phosphate. Regression equations, which included terms both for adsorption, and for extractable molybdate or phosphate, gave a good description of the yield of clover plants grown on the soils

Field 02-WATER CYCLE

Group 2G-Water in Soils

without added molybdate or phosphate, respectively. The ability of the soils to adsorb molybdate and phosphate increased with annual rainfall. The apparent influence of rainfall on adsorption was greater for soils derived from basalt or trachyte than for soils derived from granite or sedimentary rocks. Oxalate-extractable molybdate was lower in soils derived from sedimentary rocks than from basaltic or trachytic rocks. Soils derived from granite varied widely, 2 having very high contents. Fluoride-extractable phosphate was very low in soils derived from trachyte, granite, and sedimentary rocks, reflecting the P levels in the parent rocks. Fluoride-Extractable phosphate was also low on the krasnozems despite large variations in the phosphate content of the parent rock. On the other basaltic soils the extractable phosphate was directly related to the phosphate content of the parent rock.—Copyright 1972, Biological Abstracts, Inc.
W73-01887 W73-01887

FUNDAMENTAL STUDIES ON THE TILE DRAINAGE IN HEAVY SOILS: INVESTIGATION BY ELECTRICAL ANALOGUE METHOD, (IN JAPANESE), Hirosaki Univ. (Japan). Lab. of Land Reclamation

Shingo Yabashi. Bull Fac Agric Hirosaki Univ. 17. p 92-101. 1971. Buil readily summary.

Identifiers: *Drainage (Tile), *Electrical analogue method, Flow, *Permeability, *Soils (Heavy).

In heavy soils, the permeability in the tilth layer is larger than that of subsoil layer. The water flow mechanism in heavy soils is based on the similarity m's law and Darcy's law, using agar as a solvent. It is assumed that specific electrical con-ductivity K1 corresponds to permeabilities of the soils in the tilth layer and trench backfill materials, K2 to that of the subsoil layer. This drainage to that of the subsoil layer. This drainage problem was solved for 5 permeability ratios K1/K2 equals 1, 10, 100, 1000, infinity. When K1/K2 is equal to 1 (homogenous), the deeper the depth of drain tiles, the more the drainage discharge. When K1/K2 is acqual to 10. depth of drain ties, the more the drainage discharge. When KI/K2 is equal to 10 or 100, a lit-tle water flows through the subsoil layer; at 1000 or greater, very little water flows through it, so that as the ratios of KI/K2 increase drainage that as the ratios of KI/KZ increase dramage discharge decreases. Most of the water must flow laterally through the tilth layer in order to reach the more permeable trench backfull material. Thus drain tiles placed deeply are ineffective.—Copyright 1972, Biological Abstracts, Inc. W73-01820

2H. Lakes

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
For primary bibliographic entry see Field 06B.
W73-01307

EXPERIMENTAL HYDROLOGIC INVESTIGA-TIONS AT THE VALDAY FIELD LABORATO-RY (EKSPERIMENTAL'NYYE GIDROLOGICHESKIYE ISSLEDOVANIYA NA

VALDAYE). Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR). For primary b rimary bibliographic entry see Field 02D. W73-01332

ILLINOIS BEACH ACQUISITION, LAKE COUNTY, ILLINOIS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).

Bureau of Outdoor Recreation, Ann Arbor, Mich. For primary bibliographic entry see Field 04A.

W73-01400

LIMNOLOGICAL STUDIES ON BIGHORN LAKE (YELLOWTAIL DAM) AND ITS TRIBU-TARIES, Montana State Univ., Bozeman. For primary bibliographic entry see Field 05C. W73-01435

A FEASIBILITY STUDY OF A LABORATORY MODEL AS A RESEARCH TOOL FOR IM-POUNDMENT WATER QUALITY INVESTIGA-

Oklahoma Univ., Norman. For primary bibliographic entry see Field 05B. W73-01442

LIMINOLOGICAL LIMNOLOGICAL INVESTIGATIONS OF MOUNTAIN LAKE, GILES COUNTY, VIR-GINIA, Virginia Polytechnic Inst., and State Univ., Virginia Polytechnic Inst., and State U Blacksburg. For primary bibliographic entry see Field 05C. W73-01447

DYNAMICS OF BENTHIC FAUNA IN WATERS OF NORTHERN MISSISSIPPI, Mississippi Univ., University. For primary bibliographic entry see Field 05C. W73-01452

FIELD ASSESSMENT OF N2-FIXATION BY LEGUMES AND BLUE-GREEN ALGAE WITH THE ACETYLENE REDUCTION TECHNIQUE, Wisconsin Univ., Madison. For primary bibliographic entry see Field 05C. For primar W73-01456

AN ANALYSIS OF FACTORS CONTROLLING DEVIATIONS IN HYDRAULIC EQUIVALENCE IN SOME MODERN SANDS, Pennsylvania State Univ., University Park. Dept. of Geoscience.
For primary bibliographic entry see Field 02J.
W73-01467

TRACE ELEMENTS IN BOTTOM SEDIMENTS FROM UPPER PEORIA LAKE, MIDDLE IL-LINOIS RIVER-A PILOT PROJECT, Illinois State Geological Survey, Urbana. For primary bibliographic entry see Field 05B. W73-01474

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 14. PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA

RIVER BASIN.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-01505

THE EFFECTS OF WATER BODIES ON AIR TEMPERATURE AND HUMIDITY DURING THE PERIOD PRECEDING THEIR FREEZING

OR OPENING,
B. P. Konovodov.
Available from NTIS, Springfield, Va 22151 as
AD-741 056. Price \$5.25 paper copy; 95 cents
microfiche. Army Cold Regions Research and Engineering Laboratory Draft Translation 305,
January 1972. 63 p, 10 fig. 2 tab, 2 ref., 4 append.
(Originally published in Trudy Tsentral'nogo Institute Prognozov, Vol 58, p 63-100). Contract
DACW-35-68-C-0069.

Descriptors: "Hydrologic data, "Reservoirs, "Environmental effects, "Atmosphere, Cold regions, Meteorological data, Temperature, Humidity, Freezing, Thawing, Surface waters, Lass, Forecasting, Engineering structures, Design

Identifiers: *USSR, *Rybinsk reservoir (USSR), *Lake Zaisan (USSR).

*Lake Zaisan (USSR).

Investigations were made in the USSR of the effect of bodies of water on temperature and humidity of air. The study included the Rybinsk Reservoir (about 50-60 km wide) and Lake Zaisan (about 90 km long and 25 km wide). The temperature and humidity of the air was measured by large model Assman aspiration psychrometers suspended vertically at heights of 200 and 15-20 cm over the surface of the ground, water, or ice. The wind velocity was measured by a hand Fuss anenometer at a height of 200 cm. The direction of the wind was determined by a Tretiakov wind gage. The temperature of the water was measured at the shore and in the middle of the reservoir by thermometers in metal cases. Cloudiness, atmospheric phenomena, the condition of the body of water (swell, ice phenomena), and data of the surface of the ground were also recorded. The data may be used for the calculation and forecasting of these factors for other bodies of water. (Woodard-USGS) W73-01511 W73-01511

MIXING OF WATER SUPPLY RESERVOIRS FOR QUALITY CONTROL, Bureau of Water Hygiene, Cincinnati, Ohio. For primary bibliographic entry see Field 05G. W73-01564

FLOW INTO A STRATIFIED RESERVOIR. California Univ., Berkeley.
For primary bibliographic entry see Field 05B.
W73-01570

THE ECOLOGY OF DIATOMS IN HARD-WATER HABITATS, Iowa State Univ., Ames. Dept. of Botany and Plant Pathology. Plant Pathology.
For primary bibliographic entry see Field 05C.
W73-01608

ANNOTATED BIBLIOGRAPHY OF LAKE ON-TARIO LIMNOLOGICAL AND RELATED STU-DIES. II. - BIOLOGY, State Univ. Coll., Buffalo, N.Y. Great Lakes Lab. E. P. Downing, J. E. Hassan, and R. A. Sweeney. Special Report No 11, January 1972. 236 p, 1 fig, 6% ref.

Descriptors: *Bibliographies, *Lake Ontario, *Limnology, *Biology, Habitats, Aquatic animals, Aquatic plants, Analytical techniques, Instrumentation, Sampling, Nets, Bioassay, Creel ceasus, Bottom sampling, Marking techniques, Trapping.

Bottom sampling, Marking techniques, Trapping.

This bibliography was compiled to aid in limnological research on Lake Ontario and its tributaries, in connection with the International Field Year on the Great Lakes (1972-1974). United States and Canadian libraries were surveyed and pertinent references abstracted with respect to parameters measured, techniques employed and locations in which the study was conducted. The location of those papers not in Buffalo and available through the Great Lakes Laboratory, are given in parenthesis at the end of the abstract. In order to locate specific aspects, the material is divided into: (A) Study regions; (B) Organisms; (C) Habitats; (D) Techniques and Instrumentation. Under these four headings are listed the numbered abstracts containing the pertinent subject matter. The study regions consist of 18 regions of Lake Ontario, shown in a figure. The organisms are listed under botanical and zoological classifications; the habitats according to locations; the techniques and instruments alphabetically. The last known address of the agency or senior author is listed. Other possibly pertinent references are included. (Jones-Wisconsin)

ANNOTATED BIBLIOGRAPHY OF LIM-NOLOGICAL AND RELATED STUDIES ON LAKE ONTARIO AND ITS TRIBUTARIES. III. -PHYSICAL, State Univ... Univ., Coll., Buffalo, N.Y. Great Lakes Lab.

J. Baldwin, and R. A. Sweeney. Special Report No 12, January, 1972. 207 p. 1 fig, 575 ref.

Descriptors: *Bibliographies, *Lake Ontario, *Limnology, *Analytical techniques, Photometry, Cores, Data processing, Dye releases, Energy, Mathematical models, Sampling, Data collections, Currents (Water), Radar, Radiation, Remote sensing, Seismic studies, Sonar, Hydrodynamics, Instrumentation, Chemical analysis, Depth, Con-ductivity, Fluorometry, Light, Evaporation, Precipitation (Atmospheric), Geology, Hydrogeology, Snow, Ice, Spectrometers, Ther-mal properties, Turbidity, Velocity, Lake morphometry, Bathymetry, Erosion, Geochemis-try, Dynamics, Meteorology, Seiches, Water levels, Tides.

This bibliography, relating to the physical aspects of Lake Ontario and its tributaries, was compiled in connection with the Great Lakes International Field Year (1972-1974) to aid limnological research. United States and Canadian libraries were surveyed and papers abstracted relating to parameters measured, techniques employed, and locations in which the study was conducted. Unless otherwise noted, the papers are located in Buffalo. In order to find certain aspects described in the papers, the material is divided into: (A) Study Regions; (B) Techniques; (C) Instrumenta-tion; (D) Parameters. Under these four headings tion; (D) Parameters. Under these four headings are listed the aumbered abstracts containing the particular subject matter. The study regions consist of 18 in Lake Ontario as shown in a figure. The techniques, instrumentation, and parameters are listed alphabetically. The last known address of the agency or senior author is given to facilitate communication if desired. A few additional per-tinent references are included. (Jones-Wisconsin)

SELECTED REFERENCES CONCERNING THE ALGAE OF LAKE ERIE. II, State Univ., Coll., Buffalo, N.Y. Great Lakes Lab.

R. A. Sweeney. Special Report No 6, March, 1970. 11 p.

Descriptors: "Bibliographies, "Algae, "Lake Erie, Plankton, Benthic flora, Diatoms, Phytoplankton, Photosynthesis, Primary productivity, Great Lakes, New York, Water supply, Systematics, Limnology, Ecology, Fish, Water pollution, Protozoa, Ohio, Eutrophication, Lake Ontario, Light penetration, Physicochemical properties, Aquatic plants, Industrial wastes, Fish food organisms, Streams.

This bibliography of 127 references is compiled to assist those conducting and/or contemplating research and instruction dealing with algae in Lake Erie. It is a compilation of references on planktonic and benthic algae previously published in various journals, reports, etc., to reduce literature search time. The citations, listed alphabetically, include 13 papers published before 1900, with the earliest dated 1872. Forty titles and references, dated from 1900 to 1949, relate to taxonomy and of that group four include pollution problems in the titles. The problem of phosphorus appears in of Lake Erie from phytoplankton records in 1964; reference to industrial pollution in 1953; several papers are on Cladophora; nine references concern photosynthesis; and six concentrate on diatoms. (Jones-Wisconsin) W73-d1615 This bibliography of 127 references is compiled to assist those conducting and/or contemplating

DEEP RESERVOIR THERMAL STRATIFICA-

DEEP RESERVOIR THERMAL STRATFICA-TION MODEL, Auburn Univ., Alabama. Dept. of Mechanical En-gineering; and Alabama Power Co., Birmingham. Water and Air Resources Section. J. S. Goodling, and T. G. Arnold. Water Resources Bulletin, Vol 8, No 4, p 745-749, 1972. 2 fig, 8 ref.

Descriptors: *Stratification, *Deep water, *Reservoirs, *Mathematical models, Thermal stratification, Forecasting, Water temperature, Thermocine, Differential thermal analysis. Identifiers: Thermal profiles.

A model for deep reservoir thermal stratification makes use of a single vertical diffusion coefficient coupled with average monthly meteorological and hydrological data and reservoir characteristics to predict monthly one-dimensional thermal profiles for an unbuilt reservoir. Until the epilimnetic depth can be quantified from an analysis of the mechanisms responsible for this isothermal region (diurnal cooling, wind induced mixing, etc.), empirical values must be used. The depth of the isothermal region during the cooling months does not have to be assumed since the instability of the surface waters requires an isothermal region to a depth corresponding to the surface temperature. Value of the hypolinnetic diffusion coefficient is chosen by observing the fact that for differently configured reservoirs and lakes, deduced values of the coefficient do not differ radically; this implies e coefficient do not differ radically; this implithe coefficient do not differ radically; this implies that for strongly stratified reservoirs where vertical advection is minor, whatever the mechanisms for thermal and mass transport at the deep depths, they can be lumped into a single parameter which can be used to predict thermal profiles in other reservoirs. Resulting model is verified against an existing reservoir. (Jones-Wisconsin) W73-01625

COMPLEX DIFFUSION PROCESSES IN COASTAL CURRENTS OF A LAKE, Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland

Journal of Physical Oceanography, Vol 2, No 1, p 80-90, January 1972. 12 fig, 1 tab, 11 ref.

Descriptors: *Lakes, *Currents (Water), *Fluorescent dye, *Diffusion, Coasts, *Circulation, *Thermal stratification, Eddies, *Lake Huron, *Lake Ontario. ron, *Lake Ontario.

Identifiers: Vertical diffusion. Horizontal diffu-

The diffusion of fluorescent dye plumes was investigated in coastal waters of Lake Huron and Lake Ontario. Many complex aspects of turbulent diffusion were revealed especially the day to day diffusion were revealed especially the day to day variability in the general coastal circulation and summer thermal stratification. Rapid current changes due to rapidly changing wind systems caused horizontal diffusion. Eddy diffusivities were enhanced by 2-4 over those of steady currents. Dye released in slow currents formed a stagnant pool, sometimes clinging to the shoreline for several days. Due to summer thermal stratification vertical diffusion of dye was significantly suppressed. In the absence of such complexities the diffusion of a dye plume was regular and characteristic of steady currents. (Ensign-PAI) W73-01636

ASSOCIATIONS OF CLADOCERA IN THE ZOOPLANKTON OF THE LAKE SOURCES OF THE WHITE NILE, Westfield Coll., London (England).

J. Green. J Zool (Lond), 165 (3): 373-414. Illus. Maps. 1971. Identifiers: Alestes-Baremose, Ceriodaphnia-Cor-nuta, *Cladocera, Daphnia-Longispina, Daphnia-Lumholtzi, Diaphanosoma-Excisum, Engraulicypris-Argenteus, Lakes, Moina-Micrura, Plankton, Sudan, *White Nile River, *Zooplankton, Crustaceans.

Thirty-one spp. of Cladocera are recorded from the lake sources of the White Nile. An account is given of the seasonal occurrence of the main planktonic species at 8 stations in Lake Albert. The horizontal distribution of species in Lake Albert was studied by vertical hauls taken at intervals along the length of the lake, and along transects from the shore to the middle of the lake it is possible to distinguish an inshore group, consisting of Moina micrura and the helmeted form of Daphnia lumholtzi, and an offshore group with Ceriodaphnia reticulata and the monacha form of D. lumholtzi. The validity of these groups is demonstrated by analyses of percentage co-occur-Ceriodaphnia reticulata and the monacha form of D. lumholtzi. The validity of these groups is demonstrated by analyses of percentage co-occurrence, correlation and regression. Diaphanosoma excisum and C. cornuta overlap these 2 groups. These distributions can be explained by the combined operation of 2 major factors: the presence inshore of the zooplanktivorous fish Alestes baremose, and competition between cladoceran species of similar sizes. The overlapping of the inshore and the offshore groups by Diaphanosoma excisum and C. cornuta can be explained by their sizes differing from the other main species sufficiently to reduce competition. Similar transects on Lake Edward again reveal Moina micrura as an inshore form and the monacha form of Daphnia lumholtzi as an offshore form. Ceriodaphnia reticulata is replaced in Lake Edward by the similarly sized C. dubia. The helmeted form of Daphnia lumholtzi was not found in the samples from Lake Edward, but it is apparently replaced by Daphnia longispina, although this species also increases in abundance offshore.

PRIMARY PRODUCTION OF LAKE BAIKAL AND ITS SIGNIFICANCE FOR THE BIOLIM-NOLOGICAL PROCESSES IN THE LAKE. (IN RUSSIAN),

For primary bibliographic entry see Field 05C. W73-01644

LAKE WATER TREATMENT SPECIAL

SPECIAL LAKE WATER TREATMENT PROBLEMS, Chicago Dept. of Water and Sewers, Ill. Bureau of Water. For primary bibliographic entry see Field 05F. W73-01669

A NOTE ON THE BENTHOS OF SOME FOREST PONDS, Polish Academy of Sciences, Krakow. Zaklad

Biologii Wod. J. Zieba.

Acta Hydrobiol. Vol 13, No 2, p 209-216. 1971. II-

Identifiers: *Benthos, Chironomidae, Forests, Oligochaeta, *Ponds.

A study was made on the bottom fauna living in forest ponds that differ in ecological conditions from the majority of carp rearing ponds. In Oct., both the composition and numbers, as well as the biomass of the predominant beathonic groups (Oligochaeta, Chironomidae) showed a greater distrophy in 3 upper ponds. In July of the following year no such marked differences were noted.—Copyright 1972, Biological Abstracts, Inc. W73-01670 A study was made on the bottom fauna living in

PRELIMINARY RADIATION SURVEILLANCE OF AN AQUATIC SYSTEM NEAR THE NEVADA SITE, JUNE - JULY, 1967, Environmental Protection Agency, Las Vegas, Nev. Western Environmental Research Lab. For primary bibliographic entry see Field 05A. Group 2H-Lakes

THE RESPONSES OF THE BIOTA OF LAKE WABAMUN, ALBERTA, TO THERMAL EF-

WABAMUN, ALBERTA, TO THERMAL FLUENT, Alberta Univ., Edmonton. Dept. of Zoology. Por primary bibliographic entry see Field 63C. W73-01704

THERMAL PLUMES IN LAKES: COMPILA-TIONS OF FIELD EXPERIENCE, Argonne National Lab., Ill. Center for Environ-mental Studies. nental Studies. or primary bibliographic entry see Field 05B. 773-01709

AKE CURRENTS ASSOCIATED WITH THE THERMAL BAR,
Case Western Reserve Univ., Cleveland, Ohio.
I. Brooks, and W. Lick.
Journal of Geophysical Research, Vol 77, No 30, p 4000-6013, October 20, 1972. 5 fig., 12 ref.

Descriptors: *Water temperature, *Great Lake *Thermal stratification, *Mathematical model Destratification, Seasonal, Water circulatio Heat balance, Currents (Water). Identifiers: *Thermal bar (Great Lakes).

Identifiers: *Thermal bar (Great Lakes).

In a time-dependent theoretical study of the thermal bar of the Great Lakes, the temperature and velocity distributions are obtained for a system consisting of water contained in a rotating annulus with a borizontally varying heat flux applied at the free upper surface. An equation of state shows a parabolic dependence of density on temperature, the maximum density occurring at 4 deg C. The analysis assumes small Rossby and Ekman numbers and allows for different values of vertical and horizontal eddy viscosities and conductivities. The temperature field is found from the time-dependent heat conduction equation. An interior flow field utilizes the 'thermal-wind' balance and is matched to Ekman layers. Inside boundary layers, the form depends on the relative sizes of the Ekman number and the ratio of eddy viscosities or conductivities, but their contributions are small compared to the interior. Both of the lines of zero meridional velocity and stream function proceed from the shore to the center of the lake, marking a change in direction of all velocity components as they go. With time, the magnitudes of the velocity components get larger in the shoreward water and smaller in the seaward water. Eventually the shoreward regime encompasses the entire lake. (Knapp-USGS)

ASSOCIATIONS
CRUSTACEANS
(CLADOCERA AND
COPEPODA) OF SELECTED DAM RESERVOIRS IN SOUTHERN POLAND,
Jagellonian Univ., Krakow (Poland). Dept. of
Hydrobiology.
K. Starzykowa.
Acta Hydrobiol. Vol 13, No 2, p 189-194. 1971. Illus. his. Identifiers: Identifiers: *Cladocera, *Copepods, *Crustaceans, Dams, Plankton, *Poland, Reser-

Associations of Cladocera and Copepoda were identified from 7 dam reservoirs and 3 stages. These associations were studied on the basis of the computed mean frequency and mean dominance of the occurring species. From the product of these 2 values a coefficient was obtained, according to which the associations were made. Considerable differences were observed in the values of this coefficient between 1 or 2 dominants and the other species occurring in the association. As a result of these investigations 17 various associations were obtained, composed of 13 spp. These associations are characterized by a considerable similarity, especially in reservoirs of the same character.—Copyright 1972, Biological Abstracts, Inc.

inc. W73-01761

FISH PROTEIN CONCENTRATE: PROTEIN VALUE OF LAKE ERIE CARP, SHEEPSHEAD AND ALEWIFE AS EAW MATERIAL, State Univ. Coll., Buffalo, N.Y. Great Lakes Lab. For primary bibliographic entry see Field 66C. W73-01799

A COMPARATIVE STUDY OF THE LENGTH-A COMPARATIVE STUDY OF THE LENGTH--WEIGHT EQUATION AND THE CONDITION FACTOR OF TILAPIA ZILLII FROM LAKE MARIUT, EGYPT, Alexandria Inst. of Oceanography and Fisheries

Alexandria Inst. of Oceanography and Fisheries (Egypt).
H. H. Saleh.
Mar Biol (Berlin). Vol 12, No 3, p 255-260. 1972. Identifiers: Comparative studies, "Egypt, Lakes, "Tilapia-Zillii, "Lake Mariut (Egypt), "Lengthweight equation (Fish).

The length-weight relationship of T. zillii Gerv., seasonally collected from Lake Mariut (a brackish-water lake), Egypt, was studied. Mature fishes are fatter than spent individuals. The females are nearly of equal fattess to the males. The smaller fish are more fecund than the larger, older individuals; this is revealed by comparison of the condition factor K and GSI (gonadosomatic index) for ripe and spent fish, respectively.—Copyright 1972, Biological Abstracts, Inc. W73-01861

COLONIZATION AND SUCCESSION OF FRESHWATER PROTOZOANS IN POLYU-RETHANE FOAM SUSPENDED IN A SMALL POND IN NORTH CARDLINA, Virginia Polytechnic Inst. and State Univ., Blacksburg. W. H. Yoague, Jr., and J. Cairns, Jr. Not Nat (Phila), 443, p1-13, 1971. Identifiers: "Colonization, Dissolved oxygen, Hardness, "North Carolina, "Polyurethane foam, Ponds, "Protozoans, Succession, Water temperature, Hydrogen ion concentration.

Units of hexahedrally shaped polyurethane foam were placed at 2.5 ft intervals at the surface of a small artificial pond near Charlotte, North Carolina to remain from 23 Dec. 1969 to 2 June 1970. Weekly determinations of the number of protozoun species inhabiting foam units as well as water temperature, pH, hardness, and dissolved 02 were made. Each week a foam unit previously unsampled was sampled and some of these were sampled several times during the 23 wk. A total of 96 spp. were identified during the first 18 wk of the study. Of these, 29 spp. had appeared (colonized in the foam units) by the end of the second wk. An average of 54.8% of the species found in initial samples were 'resident' species (e.e., a group that persisted throughout the study period). After the first 2 wk there were 3 wk in which 9 or 10 new species on week 10, 7 were lost in the week's immediately thereafter). The number of species or week 10, 7 were lost in the week's immediately thereafter). The number of species present at any one time ranged from 15 (end of first week of study) to 43 (end of 19th week of study). The oscillations appear to have been caused by appearance and disappearance of transient species.—Copyright 1972, Biological Abstracts, Inc. W73-01863

GENERAL PRELIMINARY CONTRIBUTION TO THE PLANKTON OF EGYPT, Alexandria Inst. of Oceanography and Fisheries

Regypt).
Mostafa Salah, and Gizella Tamas.
Bull Inst Oceanogr Fish. 1: p 305-337. 1970. Map.
Identifiers: Algae, *Egypt, Invertebrates, *Plankton, *Marine algae.

The species composition of the plankton of Egypt is reported, mainly the free-swimming forms. The data are based upon a series of samples collected at intervals during the years 1964-1965, from the

diverse habitats viz.: Mediterranean Sea, Suez Canal, Bitter Lakes, Gulf of Suez, Red Sea, Delta Lakes, Lake Karoun, and Nile River. Freshwater, brackish and marine forms of algae and inver-tebrates are given.—Copyright 1972, Biological Ab-stracts. Inc.

THE CONTENT OF COPPER, ZINC, AND MAN-GANESE IN THE WATER OF THE DAM RESERVOIR AT GOCZALKOWICE AND OF SEVERAL OTHER RESERVOIRS, Polish Academy of Sciences, Krakow. Zaklad Biologii Wod. For primary bibliographic entry see Field 05B. W73-01876

VEGETATION AND DEVELOPMENT OF LLYN, A WELSH MIRE, King's Coll., London (England). P. D. Moore, and P. J. Beckett. Nature (London). Vol 231, No 5302, p 363-365. Nature (London), Vol 251, No 3302, p 363-36 1971. Illus. Identifiers: *Llyn (Welsh mire), Minerals, *Pe stratigraphy, *Vegetation, Flant communitie Hydrogen ion concentration.

The purpose was to relate present vegetation and the history of plant succession in the basin. Communities were mapped and grouped according to floristic similarity. There was some correlation between community type and acidity and mineral contest of surface water. Peut stratigraphy revealed important factors, such as peat cutting, which led to further understanding of the vegetation.—Copyright 1972, Biological Abstracts, Inc. W73-01878

GROWTH OF WHITE CRAPPIE AND GIZZARD SHAD IN LAKE KEYSTONE, OKLAHOMA, Oklahoma State Univ., Stillwater, Dept. of Zoolo-

gy. For primary bibliographic entry see Field 05C. W73-01892

THE HISTORY OF LAKE GORBACZ, Polish Academy of Sciences, Bialystock. Dept. of Biology. For primary bibliographic entry see Field 02J. W73-01893

GREAT LAKES BASIN COMMISSION, AN-NUAL REPORT, FISCAL YEAR ENDING JUNE 30, 1970. Water Resources Council, Washington, D.C. For primary bibliographic entry see Field 06E. W73-01908

2I. Water in Plants

TRACE ELEMENTS IN SOILS, FLANTS, AND WATER OF THE SOUTHERN FART OF WESTERN SIBERIA OMERGELEMENTY V POCHVAEH, RASTITEL'NOSTI I VODAKH YUZHNOV CHASTI ZAPADNOV SIBERI).
Novosibirik Inst. of Agrochemistry and Soil Science (USSR).
For primary bibliographic entry see Field 02K.
W73-01329

BORON IN SOILS, PLANTS, AND WATER OF THE KYSHTOVKA RAYON IN NOVOSIBIRSK OBLAST (BOR V POCHVAKH, RASTITEL'-NOSTI I VODAKH KYSHTOVSKOGO RAYONA NOVOSIBIRSKOY OBLASTI), Novosibirsk Inst. of Agrochemistry and Soil Science (USSR). For primary bibliographic entry see Field 02K. W73-01330

Erosion and Sedimentation—Group 2.1

BENTHIC INSECT COMMUNITIES OF STREAMS IN STORA SJOPALLET NATIONAL PARK, SWEDISH LAPLAND, Lund Univ. (Sweden). Dept. of Animal Ecology. S. Ulfstrand, B. Svensson, P. H. Enckell, L. S. Ultstrand, B. Svensson, P. H. Enckell, L. Hagerman, and C. Otto. Entomol Scand. 2 (4): 309-336. Illus. 1971. Identifiers: "Benthic insects, "Brachyptera-risi, Beathic communities, Diptera, Ephemeroptera, Insects, "Swedish Lapland, National park, Plecoptera, Streams, Trichoptera, Sweden.

Benthic animal communities in streams with varying environmental conditions in a national park in northern Swedish Lapland were analyzed. Dominant taxa were Ephemeroptera, Pocoptera, Trichoptera and Diptera Simulidae. Northeasterly or very widely spread species make up the fauna. Intrariverine distribution patterns were found to differ between taxa, and great variations of standing crop values between adjacent sampling sites were the rule. Day-to-day fluctuations of drift rate were unsynchronized between taxa. Some ecological properties of Brachyptera risi are discussed. Some lake shores and streams affected by hydroelectric exploitation appeared virtually devoid of macroscopic animals.—Copyright 1972, Biological Abstracts, Inc. W73-01365

DROUGHT RESISTANCE AND INTERNAL WATER BALANCE OF OAK SEEDLINGS, Forest Service (USDA), Bend, Oreg. Pacific Northwest and Range Experiment Station. K. W. Seidel.

Forest Science, Vol 18, No 1, p 34-40, 1972. 3 tab. 1 fig. 16 ref.

Descriptors: *Drought tolerance, *Drought re-sistance, *Transpiration, *Plant physiology, *En-vironmental effect, *Dehydration, *Transpiration, Water balance, Moisture stress, Physiological ecology, Hydrologic budget, Stomata, Forced dry-ing.

The evaluation of drought resistance in higher plants is complicated by the fact that they are homoiohydric; that is, they have the ability to maintain a higher water potential than that of their environment which helps them avoid drought conditions. The homoiohydric nature of higher plants are the composed of ditions. The homoiohydric nature of higher plants suggests that drought resistance is composed of two components—one related to the ability to survive dehydration (drought tolerance), and the other related to the ability to postpone dehydration (drought avoidance). Drought tolerance of a species is dependent upon inherent properties of the protoplasm, whereas drought avoidance is related to structural features that affect water absorption and loss. These two components were measured io structural features that affect water absorption and loss. These two components were measured on greenhouse-grown seedlings of white oak, black oak, northern red oak, and post oak. Leaf water characteristic curves, relating leaf water potential to leaf relative water content, were developed for the four species. The effect of decreasing soil and leaf water potential on the transpiration rate was determined. Small reducions in leaf water potential in the range of \$6 to -16 bars resulted in a large decrease in the transpiration rate attributed to stomatal closure. Post oak was the most drought resistant of the four species; drought tolerance and avoidance of red oak was the lowest of the four species. (Black-Arizona) W73-01759

THE INFLUENCE OF PHOSPHORUS AND NITROGEN ON MILLET AND CLOVER GROWING IN SOILS AFFECTED BY SALINITY, IL PLANT COMPOSITION, Hebrew Univ., Rehovot (Israel). Dept. of Soil Science.

For primary bibliographic entry see Field 03C.

RHODOMONAS OVALIS NYGAARD AS FOOD RHOUDOMONAS OVALIS RYGARD AS FOOI FOR CLAM LARVAE, (IN JAPANSSE), Hirothima Univ. (Japan). Faculty of Fisheries an Animal Husbandry. Hideo Iwasaki, Shunsuke Tanaka, and Toraya Fujiyama.

Bull Jap Soc Sci Fish. Vol 37, No 11, p 1044-1048.

1971. Illus. English Summary.

Identifiers: Chromulina, "Clams, "Larvae (Clams), "Rhodomonas-Ovalis, Scapharca-Subcrenata, Algae, Microorganisms.

crenata, Algae, Microorganisms.

Experiments were carried out to find suitable microorganisms as foods for clam larvae. Among the 5 genera of algae used in the experiment, R. ovalis was the best single food for the larvae of Scapharca subcrenata Lischke. A mixture of R. ovalis was the best single food for the larvae of Scapharca subcrenata Lischke. A mixture of R. ovalis and Chromelina sp. (Chlorophyceae) also provided better growth of the larvae. Artificial medium and enriched sea water which promote the high growth rate of R. ovalis were prepared. Maximal growth of 5.8 x 1,000,000 cells/ml) was maintained by harvesting 40-60% of the culture in the exponential phase every other day and by replenishing with an equal quantity of the new medium. The old culture (phase of declining relative growth rate) did not maintain the constant level, even if diluted to 1 difference 2 x 1,000,000 cells/ml. The principal amino acids of R. ovalis are in general agreement with other reports. Glutamic acid showed a comparatively high value. The essential amino acid index (EAA index) was 77.—Copyright 1972, Biological Abstracts, Inc.

PERIODIC NOCTURNAL STOMATAL OPEN-

PERIODIC NOCTT/IRNAL STOMATAL OPEN-ING OF CITRUS IN A STEADY ENVIRON-MENT, Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab. W. L. Ehrier. Physiol Plant. Vol 25, No 3, p 488-492. 1971. Illus. Identifiers: Citrus-Aurantium-D, Citrus-D, Citrus-J Jambhiri-D, "Leaves, "Lemon-D, Nocturnal, "Orange-D, Periodic, "Stomatal opening, Water temperature.

In a stendy environment, leaf stomates of sour orange (Citrus aurantium L.) remained closed in the dark, whereas those of rough lemon (Citrus jambhiri Lush) underwent several 20-min periods of pronounced opening at intervals of 60-85 min. Peak nocturnal opening occurred about 10 min after the cycle began, as shown by a change in leaf diffusion resistance from 60 s cm-1 (closed) to 2 s cm-1 (open). This minimal leaf resistance equals that obtainable in rough lemon in strong illumination (26 klux). The transitory stomatal opening detected by leaf resistance measurements was corroborated by measurements of leaf temperature and leaf thickness. During nocturnal opening, leaf temperature was 2C below the value representing noncycling periods. Also, minimal leaf thickness coincided with maximal stomatal opening, the triggering mechanism for nocturnal stomatal opening appears to orginate within the plant, since the environmental factors of air temperature, humidity, CO2 concentration, and substrate (aerated water culture) were held steady.—Copyright 1972, Biological Abstracts, Inc. W73-01865

EFFECT OF SOIL WATER DEFICIENCY ON GROWTH AND METABOLISM OF BARLEY EAR IN THE CRITICAL PERIOD, (IN RUS-SIAN),

SIAN), Leningrad State Pedagogical Inst. (USSR). N. N. Savitskaya. Fiziol Rast. Vol 18, No 4, p 808-813. 1971. Illus. English summary. Identifiers: "Barley-M, "Growth, Meiosis, "Metabolism, Soil, Water deficiency, Barley ear.

Growth of the barley ear takes place mainly during the critical period and has 2 maxima: the first one during meiosis, and the second and larger maximum in the middle of the period of uninnelear pollen. Growth of the ear was mainly over by the time of the ear formation. The period of the second growth maximum, coinciding with the processes of pollen vacuolization, is characterized by a delayed decrease of the ear water content, which was maintained at the same level in 3-4 days, and by a sharp fall in the content of protein N. Water deficiency in soil impairs the ear growth resulting in a low yield.—Copyright 1972, Biological Abstracts, Inc. stracts, Inc. W73-01868

NITROGEN LOST AS AMMONIA FOLLOWING FERTILLIZATION IN A JACK PINE FOREST, Laval Univ., Quebec. Faculty of Forestry and

D. Bernier Carrier, and B. Bernier.
Can J For Res. Vol 1, No 2, p 69-79. 1971. Illus.

Can J For Res. '91 1, 10 2, p English summary. Identifiers: "Ammonia, "Fertilization, Forest, Hydrolysis, "Jack pines, Leaching, "Nitrogen, Pine-G, Pinus-Banksiana-G, Urea, Volatilization.

Pine-G, Pinus-Banksiana-G, Urea, Volatilization.

In a field study, percentage of N lost as ammonia from a jack pine (Pinus banksiana Lamb.) soil increased with increasing rates of urea application between 112 and 448 kg N/ha. After 7 days, losses amounted to 18-28% of a 224 kg urea-N/ha application, representing 60-87% of the total losses measured over a 6-wk period. Maximum volatilization rates occurred between the 3rd and the 5th day after fertilization, at which time urea hydrolysis was virtually complete. Negligible ammonia losses were measured in plots treated with (NH4)2SO4, NH4NO3, and S-coated urea. Applying superphosphate with urea markedly depressed ammonia volatilization, an effect which was enhanced by a joint application of K2SO4.MgSO4. Reduction of volatilization by artificial precipitation was significant and increased with increasing precipitation when the latter was applied soon after fertilization; decreases in volatilization were then related to the amount of residual urea subject to diffusion into the humus layer or to leaching towards the underlying soil horizons.—Copyright 1972, Biological Abstracts, Inc.

2J. Erosion and Sedimentation

INVENTORY REPORT—COLUMBIA-NORTH PACIFIC REGION, WASHINGTON AND OREGON. Corps of Engineers, Portland, Oreg. North Pacific For primary bibliographic entry see Field 08B. W73-01296

SUMMARY OF TURBULENCE DATA FROM RIVERS, CONVEYANCE CHANNELS AND LABORATORY FLUMES, Geological Survey, Bay St. Louis, Miss. For primary bibliographic entry see Field 08B. W73-01305

PARTICLE SEDIMENT IN CURVED PATH PLOW, Clemson Univ., S.C. Dept. of Engineering Mechanics.
L-Y. Chen.
M Sc Thesis, December 1971. 54 p, 15 fig. 6 tab, 14

Descriptors: "Sediment transport, "Particle size, Waste water treatment, "Mathematical models, "Sedimentation, Methodology, Analytical techniques, Flow rates, Vortices, Fluid mechanics, Viscosity, Depth, Equations, Forecasting, Water treatment.

Field 02-WATER CYCLE

Group 2J-Erosion and Sedimentation

The problem of particle sediment in flow is important in the treatment of waste water and domestic supplies. Sedimentation characteristics of heavy particles in curved path flow were investigated, and a mathematical expression was developed to predict the location of particle settlement. The flow used was an incompressible, steady, spiral discharge free surface vortex flow. The grit samples used in the experiment ranged in size from No. 16 to No. 200, U. S. standard ASTM sieves. In the derivation of the mathematical expression, assumptions were made to simplify the complicated three-dimensional problem to a two-dimensional case. It was assumed that the settling velocity which is obtained from the concept of the equilibrium of the driving force and the drag force is constant after an initial acceleration. It also was assumed that there existed a relative velocity between the particle and the fluid. The expression derived for a single particle. The expression derived can be used to predict the settlement position of particles ranging from No. 16 to No. 100. (Woodard-USGS)

PARTICLE SETTLEMENT IN SPIRAL VORTEX PLOW, Clemson Univ., S.C. Dept. of Engineering. For primary bibliographic entry see Field 05F. W73-01310

AN ENGINEERING APPROACH TO TOTAL BED-MATERIAL LOAD BY REGRESSION ANALYSIS, Colorado State Univ., Fort Collins. Dept. of Civil Engineering. For primary bibliographic entry see Field 08B. W73-01311

INVENTORY REPORT—ALASKA REGION. Corps of Engineers, Portland, Oreg. North Pacific Div. For primary bibliographic entry see Field 08B. W73-01316

PROCEEDINGS PROCEEDINGS MISSISSIPPI RESOURCES CONFERENCE, 1972. WATER

Mississippi Water Resources Research Institute Publication, 1972. 221 p. OWRR A-999-MISS (8).

Descriptors: *Mississippi, *Water resources development, Erosion, Sampling, Rainfall-runoff relationships, Erosion control, Turbulent flow, Reservoir operation, Legislation, Water pollution control, Remote sensing, Levees, Water manage-ment (Applied), River basin development.

ment (Applied), River basin development.

The seventh Mississippi Water Resources Conference was held in Jackson on 11-12 April 1972 for the purpose of exchanging information pertaining to water resources. Topics discussed include automatic suspended sediment pumping samplers, the erodibility of cohesive materials, variations in runoff and sediment yields as influenced by hydrologic and physical characteristics, representations of rainfall and runoff, similitude for turbulent liquid flow in pipes, water quality aspects of reservoir operation, water pollution control legislation, remote sensing techniques, stone dike systems on the lower Mississippi, erosion at culvert outlets, impact of recreation on water resources management, planning in Pearl River basin, hydrologic performance of eroded lands stabilized with pine, and impact of recent laws and regulations on water resources. (See W73-01318 thru W73-01324) (Knapp-USGS)

FIELD PERFORMANCE AND EVALUATION OF TWO AUTOMATIC SUSPENDED SEDI-MENT FUMPING SAMPLERS, Agricultural Research Service, Oxford, Miss. Sedimentation Lab.

C. E. Murphree, L. L. McDowell, G. C. Bolton, and A. J. Bowie.
18: Proceedings of Mississippi Water Resources Conference, April 11-12, 1972; Mississippi Water Resources Research Institute Publication, p 1-18, 1972. 81g, 2 tab, 9 ref.

Descriptors: *Sampling, *Equipment, *Automa-tion, *Calibrations, *Suspended load, Particle size, Samds, Silts, Clays, Pumping, Testing. Identifiers: *Suspended load samplers.

Identifiers: *Suspended load samplers.

Preliminary results are given of field tests of two types of pumping samplers (US PS-67 and US PS-69) developed by the Federal Inter-Agency Sedimentation Project for automatically collecting suspended sediment samples in flowing streams. The automatic samplers were designed to collect suspended-sediment samples from a fixed point in the cross section of a flowing stream. The performances of these samplers were tested on sand bed ephemeral streams, which transport high percentages of sand in suspension. The pump sample sediment concentrations were compared with depth-integrated mean cross section sample concentrations collected manually. No significant difference was observed in the fine sediment concentrations, but the pump sample sand concentrations were not representative of the measured sand concentrations. Since size distributions are related, in part, to the sediment source areas, runoff characteristics, and the channel hydraulics, it is essential that mean cross section samples be collected at each gaging station for comparison. It is equally important that the temporal distribution of the sediment load be defined throughout the hydrograph for accurate comparisons between the cross section and pump sediment discharge relationships. (See also W73-01317) (Knapp-USGS)

LABORATORY STUDIES OF THE ERODIBILI-TY OF COHESIVE MATERIALS, Agricultural Research Service, Oxford, Miss. Sedimentation Lab. E. H. Grissinger. In: Proceedings of Mississippi Water Resources Conference, April 11-12, 1972; Mississippi Water Resources Research Institute Publication, p 19-36, 1972. 10 fig, 3 tab, 2 ref.

Descriptors: *Erosion, *Cohesion, *Laboratory tests, Moisture content, Scour, Particle size, Alluvium, Clays, Sands, Silts, Wetting, Drying, Cohesive soils.
Identifiers: Cohesive sediments

Identifiers: Cohesive sediments.

These materials are in beds and banks of ephemeral streams and above base flow in perennial streams. Laboratory studies were conducted to evaluate the influences of soil water variables on stability of periodically wet materials. Measured erosion rates varied directly with rates of change of water content in the samples. Water entry into a cohesive material is an internal stress-producing process, and should be considered in conjunction with other erosive forces. Antecedent water content and water temperature, to the degree that they influence water content, indirectly influence stability. Sample composition has a dual role: (1) a direct influence on stability by determining the development of cohesive forces, and (2) an indirect influence on stability by determining the pertinent hydrologic properties of the sample. The measured erosion rates varied inversely with aging time. This is attributed to the development of cohesive forces. Decay of the internal strain, that is, the strain produced by water sorption, may also be involved. (See also W73-01317) (Knapp-USGS)

VARIATIONS IN RUNOFF AND SEDIMENT YIELDS OF TWO ADJACENT WATERSHEDS

AS INFLUENCED BY HYDROLOGIC AND PHYSICAL CHARACTERISTICS, Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
A. J. Bowie, and G. C. Bolton.
In: Proceedings of Mississippi Water Resources Conference, April 11-12, 1972; Mississippi Water Resources Research Institute Publication, p 37-56, 1972. 6 fig, 4 tab, 5 ref.

Descriptors: "Rainfall-runoff relationships, "Water yield, "Sodiment yield, "Small watersheds, "Mississippi, Land use, Hydrogeology, Demonstration watersheds, Topography, Soil properties, Runoff, Model studies, Erosion, Sedimentation, Stream gages.

Runoff and sediment yield were studied to find the effects of hydrogeology and topography in two adjacent watersheds in the Pigeon Roost Creek basin in north Mississippi. During the 14-year period of record (water years 1938-1971), the runoff and sediment yield is consistently in the weight ratio of 2 to 1. Weighted precipitation during the period varied only alightly. Intensive surveys were made of the land use, topography, soils, and geology of both watersheds. Differences in the geology and soils account for most of the difference in runoff from the two watersheds. (See also W73-01317) (Knapp-USGS)

THE APPLICATION OF REMOTE SENSING TECHNIQUES FOR DATA COLLECTION ON THE MISSISSIPPI RIVER, Army Engineer District, Vicksburg, Miss. River Stabilization Branch.
For primary bibliographic entry see Field 07B. W73-01322

PRACTICAL GUIDANCE FOR ESTIMATING AND CONTROLLING EROSION AT CULVERT OUTLETS, Army Engineer Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 04D. W73-01324

SEDIMENTATION ASPECTS, PROJECT FOR NAVIGATION AND FLOOD CONTROL, LOWER COLORADO RIVER, TEXAS, Corps of Engineers, Washington, D.C. Committee on Channel Stabilization.
C. P. Lindner, and G. B. Fenwick.
Committee on Channel Stabilization, Technical Report No. 9, May 1972. 19 p, 2 tab, 3 pl.

Descriptors: *Colorado River (Texas), Dredging, *Flood control, *Navigation, *Sedimentation, *Channel improvement. Identifiers: *Gulf Intracoastal Waterway, *Matagorda Bay, *Channel stabilization.

*Matagorda Bay, *Channel stabilization.

Personnel from U.S. Army Engineer District, Galveston, described the project and requested advice from the Committee on Channel Stabilization in the following four areas: (a) sediment load that would enter Matagorda Bay and the accompanying rate of delta development resulting from construction of the authorized improvements; (b) effect that the continued maintenance dredging of the authorized shallow-draft channel above the Gulf Intracoastal Waterway crossing would have on reducing sediment discharge into Matagorda Bay; (c) desirability or need of a control-type structure or other provision for controlling sediment discharge into bay; and (d) effects of a proposed diversion facility on sediment deposition in the avigation channel. Report furnishes Committee comments in these four areas. Comparison of effects of removal of rafts, silting basin, man's activities (as housing, cultivation, etc.), elimination of Gulf outdet, lowering of stage at Gulf Intracoastal Waterway, and saltwater-freshwater interaction is given. (Spivey-WES)

W73-01382

A FIELD STUDY OF FLOCCULATION AS A FACTOR IN ESTUARIAL SHOALING PROCESSES, Corps of Engineers, Washington, D.C. Committee on Tidal Hydraulics.
For primary bibliographic entry see Field 02L.
W73-01387.

TECHNIQUE FOR ASSESSMENT OF PARTI-CLE BREAKAGE IN NATURAL AND ARTIFI-CIAL ENVIRONMENTS, Commonwealth Scientific and Industrial Research Organization, Canberra. (Australia). Div. of Soils. A. J. Moss. Journal of Sedimentary Petrology, Vol 42, No 3, p 725-728, September 1972. 3 fig, 6 ref.

Descriptors: "Sedimentology, "Particle size, "Sediment transport, "Sands, "Strength, Quartz, Soil strength, Failure (Mechanics). Identifiers: "Particle (Mechanics).

Direct assessment of particle breakage, in both natural and artificial sedimentary environments, is possible by comparing the strengths of suites of particles which have survived a process with the strengths of suites that have not been involved in the same process. The fragmentation load is the load required to bring about breakage of an individual particle between parallel plane surfaces. It is measured in a slightly modified unconfined compression test machine. Fragmentation of coarse plutonic quartz appears to be a major process in a stream. (Knapp-USGS) W73-01462

PORE FLUID AND MINERALOGICAL STU-DIES OF RECENT MARINE SEDIMENTS: RAUBER DEPRESSION REGION OF EAST PACIFIC RISE, University of Southern California, Los Angeles. Dept. of Geological Sciences. For primary bibliographic entry see Field 02K. W73-01463

AEROLIAN DEPOSITS OF CLAY SAND, Manitoba Univ., Winnipeg. Dept. of Earth Sciences. For primary bibliographic entry see Field 02C. W73-01464

UNIVERSAL DISCONTINUITIES IN BEDFORMS PRODUCED BY THE WIND, Reading Univ. (England). Sedimentology Research Lab.
1. G. Wilson.
Journal of Sedimentary Petrology, Vol 42, No 3, p 667-669, September 1972. 2 fig, 1 tab, 2 ref.

Descriptors: *Sedimentary structures, *Dunes, *Winds, Sands, Saltation, Ripplemarks, Vortices, Turbulent flow, Wind erosion, Dune sands, Sand

Grain size, wavelength and experimental data on sand bedforms produced by the wind indicate the existence of eight distinct groups of structural elements, presumably formed by different mechanisms. Elements of similar wavelength are often associated, one normal and the other parallel to the wind. One kind of transverse ripple is probably formed by the impact of saltating grains; longitudinal elements associated with it may be due to vortices which develop as a result of the interaction between the transverse ridge and the air-flow. The other six elements, which when paired make up aerodynamic ripples, dunes and draas, are probably all caused by secondary flows which are themselves due to primary instabilities in the airflow. (Knapp-USGS)

THE NATURE AND OCCURRENCE OF HEAVY MINERALS IN PLEISTOCENE AND HOLOCENE SEDIMENTS OF THE LOWER GEORGIA COASTAL PLAIN, Unit of Coastal Sedimentation, Taunton (En-

ganoi, J. R. Hails, and J. H. Hoyt. Journal of Sedimentary Petrology, Vol 42, No 3, p 646-666, September 1972. 10 fig. 5 tab, 22 ref. NSF Grants GP 1380 and NSF-GA 704.

Descriptors: "Sedimentology, "Mineralogy, "Coastal plains, "Georgia, "Provenance, Sedimentation, Stratigraphy, Sediment sorting, Pleistocene epoch, Soil formation, Weathering, Sands, Dunes, Beaches, Bottom sediments, Sand bars. Identifiers: "Heavy minerals.

The lower Georgia Coastal Plain consists of six Pleistocene barrier island coastlines. Each barrier sequence can be subdivided into lagoon-salt marsh and barrier island facies. The lagoon facies include estuary and tidal channel sediments, whereas the barrier island facies include dune, littoral and offshore channel deposits. Thus, each barrier sequence constitutes a formation. The Georgia Sea Islands bordering the mainland are, for the most part, Holocene in age. The Pleistocene deposits are deeply podzolized in marked contrast to the poorly developed soil profiles in the Holocene sediments. Analysis of the heavy mineral fraction of samples from the Pleistocene Formations shows that, despite pedogenesis and diagenesis, there is no apparent relationship between depth of weathering and occurrence of minerals. Distinctive constituents of the Pleistocene barrier island deposits in order of occurrence are sillimanite, and deposits in order of occurrence are sillimanite staurolite, kyanite, epidote, hornblende, garnet, andalusite and zoisite-a medium to high grade metamorphic suite. Two heavy mineral provinces can be distinguished, based primarily on the epidote and green hornblende content of the Pleistocene and Holocene sediments. These are a Holocene beach province, fairly high in both epidote and green hornblende, and a Pleistocene province low in both minerals. These two provinces are also distinctive with regard to the amount of sillimanite which is far more abundantin Pleistocene than in Holocene sands. The heavy minerals of the Georgia Coastal Plain were derived originally from the Georgia Piedmont. (Knapp-USGOS)

AN ANALYSIS OF FACTORS CONTROLLING DEVIATIONS IN HYDRAULIC EQUIVALENCE IN SOME MODERN SANDS, Pennsylvania State Univ., University Park. Dept. of Geoscience.

Pennsylvania State Univ., University Park. Dept. of Geoscience.

R. Lowright, E. G. Williams, and F. Dachille.
Journal of Sedimentary Petrology, Vol 42, No 3, p
635-645, September 1972. 20 fig, 1 tab, 16 ref. NSF
Grant GA-13012.

Descriptors: *Sedimentology, *Beaches, *Sediment sorting, Sediment transport, Settling velocity, Density, Dunes, Bed load, Saltation, *Lake Brie.

Identifiers: *Hydraulic equivalence (Sands).

Heavy and light minerals in beach, dune and offshore sands from Lake Erie exhibit a systematic divergence from hydraulic equilibrium. As grain size increases, the settling velocity ratio of heavy to light grains decreases, a condition which can be predicted from pickup equations, and is therefore a hydrodynamic rather than a source phenomenon. Also, the concentration of heavies is positively correlated with the velocity ratio. This relationship is explained by a rolling and saltation model, in which larger, lighter grains are most easily removed, leaving behind smaller heavy and light minerals of about the same size but different settling velocities. Paleozoic sandstones exhibit greater divergence from hydraulic equilibrium than modern sands and have lower heavy mineral concentration, a phenomenon attributed to extensive reworking and recycling. (Knapp-USGS)

W73-01467

SOME SEDIMENTOLOGICAL ASPECTS OF PLANAR CROSS-STRATIFICATION IN A SANDY BRAIDED RIVER, Illinois Univ., Chicago. N. D. Smith. Journal of Sedimentary Petrology, Vol 42, No 3, p 624-634, September 1972. 13 fig. 55 ref.

Descriptors: *Sedimentary structures, *Bed load, *Braiding, Sedimentation, Sedimentology, Nebraska, Sands, Sediment transport, Sand waves, Ripple marks, Stratigraphy. Identifiers: *Platte River (Nebr), *Cross-stratification

Identurers: "Platte River (Nebr), "Cross-stratification.

Tabular sets of planar cross-stratification are characteristic structures produced by transverse bars in the sand-bed Platte River in Nebraska. Sedimentologic characteristics of the bars provide potentially useful information for interpreting the origin of planar cross-strata in ancient deposits. Alternating coarse and fine-graded foreset laminations result from continuous avalanching at bar margins of sediment previously sorted by small scale bed forms on the bar surface. Surface dune transport yields thicker and more distinct coarse-fine foreset laminae than ripples. Foreset angles of inclination tend to decrease with increasing flow regime. Several structures are produced at active bar margins swept by side currents, including ripples and dunes perpendicular to the bar slip face, foreset spurs, and straight-crested ripples on the slip face. Each of these structures produce small scale cross-stratification oriented at high angles to the associated planar cross-bed. Large differences between current and foreset dip azimuths frequently occur because of the irregular and lobate shapes of transverse bars. Only 30.5% of the bar foreset directions correspond to within 5 deg of the currents that formed them. Foreset dip azimuths in a straight 2.1-km reach of the lower Platte are widely dispersed, although their vector mean accurately identifies the direction of the main channel complex. Planar cross-bed orientations computed for the entire Platte plus the Nebraska portion of the South Platte yielded a variance of 6,129 and a vector magnitude of 35.6% indicating dispersions greater than commonly assumed for braided streams. (Knapp-USGS)

RESUSPENSION OF ESTUARINE SEDIMENTS BY SMALL AMPLITUDE WAVES, New Hampshire Univ., Durham. Dept. of Earth Sciences; and New Hampshire Univ., Durham. Jackson Estuarine Lab. For primary bibliographic entry see Field 02L. W73-01469

TIDAL CURRENT CONTROL OF SEDIMENT DISTRIBUTION IN NORTHUMBERLAND STRAIT, MARITIME PROVINCES, Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab. For primary bibliographic entry see Field 02L. W73-01470

PEDIMENTS AND PEDIMENT-FORMING PROCESSES, Geological Survey, Denver, Colo. P. F. Hadley. Journal of Geological Education, Vol 15, No 2, p 83-89, April 1967. 2 fig, 31 ref.

Descriptors: "Geologic formations, "Sediment transport, "Alluvium, "Rill erosion, "Arid lands, Reviews, Land forming, Slopes, Geomorphology, Terrain analysis, Topography. Identifiers: "Pediment forming processes, "Pediments.

Group 2J-Erosion and Sedimentation

This discussion emphasizes the wide divergence of opinion among geomorphologists regarding the origin of pediments and the processes involved. There are, however, some points of general agreement. Pediments are a typical landform of arid and semiarid regions which are regarded by most investigators as 'slopes of transportation.' The climatic factors of the drier regions are best suited for pedimentation. Of the hypotheses proposed for the formation of pediments, the one favoring weathering of the mountain front or escarpment and removal by rill wash or unconcentrated flow seems to be most widely accepted. Other questions concern the processes of pediment alluviation and the role of regrading of pedimented landscapes. (Woodard-USGS)

TRACE ELEMENTS IN BOTTOM SEDIMENTS FROM UPPER PEORIA LAKE, MIDDLE IL-LINOIS RIVER—A PILOT PROJECT, Illinois State Geological Survey, Urbana. For primary bibliographic entry see Field 65B. W73-01474

SOME ARCTIC COASTAL FEATURES AROUND FOXE BASIN AND IN E. BAFFIN ESLAND, N.W.T. CANADA, Nottingham Univ. (England). Dept. of Geography. For primary bibliographic entry see Field 02C. W73-01476

TRANSPORT VELOCITIES OF INDIVIDUAL SIZE FRACTIONS IN HETEROGENEOUS BED LOAD, a State Univ., Baton Rouge, Coastal Stu-

caes inst.

N. Meland, and J. O. Norrman.
Geografiska Ansaler, Vol 51A, No 3, p 127-144,
1969. 9 fig, 16 ref. ONR Contract Nonr 1575 (03).

Descriptors: *Sediment transport, *Sediment sort-ing, *Particle shape, *Settling velocity, *Particle size, Hydraulic models, Model studies, Deposition (Sediments), Sedimentation, Sedimentology, Bed load, Erosion, Scour, Tractive forces.

load, Erosson, Scour, Tractive forces.

In order to evaluate the importance of differential transport velocities as a factor in sediment sorting by size and shape, transport velocities of individual size fractions in heterogeneous size mixtures of spherical glass beads and natural material were determined for different transport rates. Particle transport velocities in material of mixed sizes are significantly influenced by size and shape of the constituent particles. Maximum velocities occur in the intermediate size fractions for spherical glass beads and are displaced toward coarser fractions for natural material. Relative difference in transport velocities between size fractions may increase with increase in transport rate. The effect of particle shape on transport velocity decreases with increase in rate of transport. Particle settling velocity is a well defined function of geometric particle shape, while transport velocity in bed contact motion correlates only poorly with the same shape index. (Knapp-USGS)

W73-01478

SNOWPATCHES: THEIR INFLUENCE ON MOUNTAIN WALL TEMPERATURES AND THE GEOMORPHIC IMPLICATIONS, Calgary Univ., Alberta. Dept. of Geography. For primary bibliographic entry see Field 02C. W73-01479

FIRN-ICE RELATIONSHIPS, SANDY GLACIER, SOUTHERN VICTORIA LAND, ANTARCTICA, Kansas Univ., Manhattan. Dept. of Geology. For primary bibliographic entry see Field 02C. W73-01480

PALSA LOCALITIES IN PADJELANTA NA-TIONAL PARK, SWEDISH LAPPLAND, Ohio State Univ., Columbus. Dept. of Geology. For primary bibliographic entry see Field 02C. W73-01481

MICRO-CLIMATE AND EROSION PROCESSES IN THE SOUTHERN ALPS, NEW ZEALAND, Canterbury Univ., Christchurch (New Zealand). J. M. Soons, and J. N. Rainer. Geografiska Annaler, Vol 50A, No 1, p 1-15, 1968. 9 fig, 5 tab, 10 ref.

Descriptors: "Geomorphology, "Soil erosion, "Microclimatology, "Alpine, Climatology, Frost action, Sediment transport, Mountains, Rainfall, Rainfall-runoff relationships, Data collections, In-strumentation, Meteorology, Mass wasting, Degradation (Slope), Brosion rates, Solar radia-tion, Meteorological data, Hydrologic data, Cli-matic data, Microclimatology, Identifiers: "New Zealand, Needle ice.

In 1963 the Geography Department of the University of Canterbury, New Zealand, established study of microclimste and erosino processes in a small valley in one of the intermontane basins of the Southern Alps, New Zealand. The area selected is representative of a wide area of the Southern Alps, with variety of types of vegetation cover and a marked contrast in the aspect of the opposing valley sides. A storage rainfall gauge was placed beside each of 7 runoff plots. Runoff amounts show the same trends as rainfall. At most plots, during the summer months, sediment yields tend to be high when rainfall and runoff is high. At a site where needle ice melts each day, as is the case on most winter days, movements of stones 1.5 to 2.5 cm in diameter are likely to occur. A marked characteristic of the sediment removed from nearly all plots is the high percentage of material retained in the size 7 sieve (2400 microns). This frequently forms over 50% of the sample, and may amount to as much as 90-100%. A microclimatic installation was designed to provide information on the heat and water balance. Solar radiation, pet radiation, heat flux in the soil, air temperatures, humidity, and rainfall are recorded. (K-napp-USGS)

GLACIO-HYDROLOGY, DISCHARGE AND SEDIMENT TRANSPORT IN THE DECADE GLACIER AREA, BAFFIN ISLAND, N.W.T., Stockholm Univ. (Sweden). Dept. of Physical Geography.
For primary bibliographic entry see Field 02C. W73-01484

NOTES ON THE FORMATION OF FJORDS AND FJORD-VALLEYS, Bergen Univ. (Norway). Dept. of Geology. For primary bibliographic entry see Field 02C. W73-01485

POTHOLES IN CONNECTION WITH PLASTIC SCOURING FORMS, Oslo Univ. (Norway). Dept. of Geography. For primary bibliographic entry see Field 02C. W73-01486

DISSOLUTION KINETICS OF CALCIUM CAR-BONATE IN SEA WATER: 1. SATURATION STATE PARAMETERS FOR KINETIC CALCU-LATIONS, Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
R. A. Berner, and P. Wilde.
American Journal of Science, Vol 272, No 9, p
826-389, November 1972. 7 fig. 3 tab, 23 ref.

Descriptors: *Calcium carbonate, *Sea water, *Solubility, *Kinetics, *Saturation, Aqueous solu-

tions, Water chemistry, Chemical potential, Hydrogen ion concentration, Saline water systems, Carbonates, Alkalinity, Equilibrium.

Methods are presented that enable calculation of the kinetics of saturation of sea water with respect to calcular carbonate. A value of K2" for H2CO3 is sea water is based on new activity determinations, and the solubility product for calcite in deep sea water is calculated from partial molal volume data rather than from laboratory solubility measurements. To facilitate computation, diagrams expressing equilibrium constants and activity coefficients are given as a function of depth and temperature. The methods are illustrated by determination of the saturation state of water samples taken from an area of the central equatorial Pacific where in situ rate-of-dissolution studies were previously conducted. (See also W73-01488) (K-napp-USGS)

DISSOLUTION KINETICS OF CALCIUM CAR-BONATE IN SEA WATER: II. A KINETIC ORIGIN FOR THE LYSOCLINE, Yale Univ., New Haven, Conn. Dept. of Geology

J. W. Morse, and R. A. Berner.
American Journal of Science, Vol 272, No 9, p 840-851, November 1972. 6 fig. 1 tab, 16 ref. NSF Grants GA 1441 and GA 30288X.

Descriptors: *Calcium carbonate, *Sea water, *Solubility, *Kinetics, *Saturation, Aqueous solutions, Water chemistry, Chemical potential, Hydrogen ion concentration, Saline water systems, Carbonates, Alkalinity, Equilibrium.

Rates of dissolution for reagent grade calcite and carbonate-rich deep sea sediment were determined by steady state disequilibrium experiments. An abrupt change in dissolution rate was found at a change in pH of 0.14 to 1.6. This is independent of PCO2. With similar undersaturation, a sudden increase was found in rate of dissolution of polished calcite spheres suspended in the Pacific Ocean. It is also in general agreement with the level at which a marked change occurs in the amount of carbonate removed by dissolution in sediment core tops from the Pacific. These results suggest that the sharp change in dissolution rate represents a critical value of undersaturation in sea water for a change of mechanism in surface-controlled dissolution. (See also W73-01487) (Knapp-USGS)

DIFFUSION AND REACTION PROFILES OF DISSOLVED MANGANESE IN THE PORE WATERS OF MARINE SEDIMENTS, Edinburgh Univ. (Scotland). Grant Inst. of Geolo-

gy. S. E. Calvert, and N. B. Price. Earth and Planetary Science Letters, Vol 16, No 2, p 245-249, October 1972. 2 fig, 1 tab, 16 ref.

Descriptors: *Manganese, *Bottom sediments, *Connate water, *Pore water, Oxidation-reduction potential, Carbonates, Chemical precipitation, Water chemistry, Diagenesis.

High concentrations of dissolved Mn in pore waters of surface sediments and decreasing concentrations with depth may be explained by migration, re-precipitation, and reaction of Mn oxides during burial at redox boundaries. The precipitation of Mn carbonate phases and an exponentially decreasing production rate of dissolved Mn with depth may both be involved in producing the dissolved Mn profiles observed. (Knapp-USGS) W73-01489

TEXTURAL STUDY OF SEDIMENTS OF BAR-BOW STRAIT, DISTRICT OF FRANKLIN, Johns Hopkins Univ., Baltimore, Md. P. J. Henderson.

Erosion and Sedimentation—Group 2J

Maritime Sediments, Vol 7, No 3, p 126-137, December 1971. 12 fig. 22 ref.

Descriptors: "Sedimentation, "Arctic, "Particle size, "Provenance, "Currents (Water), Sounds, Bottom sediments, Straits, Sampling, Stratigraphy, Sediment transport, Sedimentology, Distributions patterns, Oceanography, Lebntiflers: "Barrow Strait (Canada).

Barrow Strait is located in the Canadian Arctic Archipelago. It is approximately 165 miles long and varies in width from 30 to 60 miles. Together with Lancaster Sound, it forms the easternmost approach to the Northwest Passage joining the Arctic and Atlantic Oceans. Barrow Strait forms a sill averaging 175 meters in depth, and serves as a barrier preventing the free interchange of waters of the Arctic and Atlantic Oceans below 250 meters. This is reflected in the variations within the temperatures and salinities on either side of the strait. The bottom of Barrow Strait is extremely hummocky and irregular, although the floor slopes geatly towards the east. Deep troughs are present in the channels separating the larger islands. The sediment consists predominantly of poorly sorted silt and mud with pebbles greater than 2 mm in diameter comprising a large portion of the sample weight in some cases. The strait is covered with ice until mid-August and serves as a center for the ice breakup in the spring. Because of these conditions and the nature of the sediment of these conditions and the nature of the sediment of these conditions and the nature of the sediment isself, it is believed that the bottom material is derived mainly from the ice. Some material may be added through river runoff, solufluction and midflows from the surrounding islands. In Barrow Strait the bottom material appears to be well agitated, which may be due to the existence of bottom currents. The distribution in the strait, therefore, appears to be controlled mainly by currents and, in part, by bottom topography. The coarsest material is on the western side of the strait, which is shallower than trouted manny by currents and, in part, ny bottom topography. The coarsest material is on the western side of the strait, which is shallower than the eastern portion, and is subjected to the strong wave and current action from Viscount Melville Sound. (Knapp-USGS)
W73-01491

RECENT MARINE SEDIMENTS OF LAN-CASTER SOUND, DISTRICT OF FRANKLIN, Bedford Inst., Dartmough (Nova Scotia). Atlantic Geoscience Center. For primary bibliographic entry see Field 02L.

PREDICTION OF RUNOFF AND EROSION PROM NATURAL RAINFALL USING A RAINFALL SIMULATOR, Agricultural Research Service, Morris, Minn. North Central Soil Conservation Research Center. R. A. Young, and R. E. Burwell. Soil Science Society of America Proceedings, Vol 36, No 5, p 827-830, September-October 1972. 3 fig. 4 tab, 6 ref.

Descriptors: "Erosion, "Rainfall-runoff relation-ships, "Simulated rainfall, "Rainfall simulators, Artificial precipitation, Model studies, On-site tests, Soil erosion, Runoff.

To interpret and apply the results of studies of ru-noff and erosion using simulated rainfall, it is necessary to know the relative effects of natural vs. simulated rainfall. A comparison was made of the soil and water losses from three natural storms and three simulated storms on cultivated fallow plots under similar rainfall and soil conditions. Soil losses from the three simulated storms. plots under similar rainfall and soil conditions. Soil losses from the three simulated storms averaged 77% of those from the natural rainstorms, with an average erosion index value for the simulated storms of 78% of that for natural rainstorms. The rusoff from the simulated storms compared quite closely to runoff from the natural storms. (Knapp-USGS)

MECHANICS OF SOIL EROSION FROM OVER-LAND FLOW GENERATED BY SIMULATED RAINFALL, Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

Engineering.
For primary bibliographic entry see Field 08D.
W73-01504

SEDIMENT LOADS IN CANALS 18, 23, AND 24 IN SOUTHEASTERN FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 02L.

PREVENTION AND CONTROL OF EROSION OF IRRIGATED LAND BY WATER (PREDOTA-VRASHCHENIYE VODNOY EROZII I BORTA-S NEYU NA OROSHAYEMYKH ZEMLYAKH), For primary bibliographic entry see Field 04D. W73-01519

DEPOSITION OF FINE SEDIMENTS IN TURBU-

DEPOSITION OF FIRE DEDIMER'S IN A DESCRIPTION OF FIRE DEPOSITION S,
Florida Univ., Gainesville. Dept. of Coastal and
Oceanographic Engineering.
E. Partheniades, and A. J. Mehta.
Copy available from GPO Sup Doc, EPI-16:16050
ERS 08/71. 30.30; microfiche from NTIS as PB213 043, \$0.95. Environmental Protection Agency
Water Pollution Control Research Series. August
1211.41 a. 11 fig. 22 and EPA Program 16050 ERS 1971. 41 p, 11 fig, 22 ref. EPA Program 16050 ERS

Descriptors: *Deposition (Sediments), *Suspended load, *Sedimentation, Sits, Clays, Sedimentology, Scour, Suspension, Shear stress, Sediment load, Shear drag, Model studies, Hydraulic models, Cohesion, Sediment transport, Turbulent flow.

Deposition of fine cohesive sediments in a turbulent flow field was studied in a system of a rotating annular channel and ring. The percentage of the total sediment that a given flow can maintain in suspension depends only on the bed shear stress and is independent of the initial sediment concentration. The percentage (C) of the depositable sediment deposited at time t has been found to vary with time according to the law C=a log t + b, where the coefficient a is independent of the flow conditions and sediment concentration, while the coefficient b is a function of the bed shear stress only. Both a and b depend on the physicochemical coefficient b is a function of the bed snear stress only. Both a and b depend on the physicochemical properties of the sediment and the water environment. Deposition rates are proportional to the depositable sediment concentration and inversely proportional to time. (Knapp-USGS) W73-015G7.

IN SITU CREEP ANALYSIS OF ROOM IN FROZEN SOIL, Colorado State Univ., Fort Collins. Dept. of Civil Bagineering. For primary bibliographic entry see Field 02C. W73-01751

SEDIMENTATION AND HYDROELECTRIC DEVELOPMENT, Army Engineer District, St. Louis, Mo., Planning

For primary bibliographic entry see Field 05C. W73-01753

RARLY DIAGENESIS IN A REDUCING FJORD, SAANICH INLET, BRITISH COLUMBIA-III. CHANGES IN ORGANIC CONSTITUENTS OF SEDIMENT, TRW Systems Group, Redondo Beach, Calif. Biosciences and Electrochemistry Dept. F. S. Brown, M. J. Baedecker, A. Nissenbaum, and J. R. Kanlan.

Geochimica et Cosmochimica Acta, Vol 36, No 11, p 1185-1203, November 1972. 5 fig, 10 tab, 41 ref. AEC Contract AT (04-3)-34.

Descriptors: "Diagenesis, "Fjords, "Canada, "Or-ganic matter, "Bottom sediments, Humic acida, Amino acida, Provenance, Fulvic acids, Stable isotopes, Carbon, Reduction (Chemical), Dis-solved oxygen. Identifiers: "Saanich Inlet (British Columbia),

As part of a study of diagenesis in the sediment of Saanich Inlet, British Columbia, groups of organic compounds were isolated from the sediment, identified, their concentration quantitatively determined and where possible, the C-13/C-12 isotope ratio determined. Chlorins show the greatest decrease with depth followed by amino acids and then fatty acids. Aliphatic straight chain hydrocarbons show little change in concentration with depth of sediment, although the aromatic hydrocarbon perylene gave evidence for in situ formation. Pulvic acids, highly abundant at the surface of the sediment, decreased significantly with depth, whereas humic acids did not appear to show any significant change. The amount of insoluble residue increased with depth, constituting the dominant organic carbon form at 17 m and below. There is no strong evidence for significant concentrations at the sediment surface, decrease or disappear with burial. Carbon isotope ratios were used to determine the relative amounts of organic matter derived from terrigenous and n arine sources. Humic acids appear to form largely from plankton-derived material and not from terrigenous plant or soil sources. (Knapp-USGS)

A GEOCHEMICAL STUDY OF SOME LITHIFIED CARBONATE SEDIMENTS FROM THE DEEP-SEA, Woods Hole Oceanographic Institution, Mass.

Woods Fore Oceanings, Thompson. Geochimica et Cosmochimica Acta, Vol 36, No 11, p 1237-1253, November 1972. 10 tab, 58 ref, ap-pend. AEC Contract AT (30-1)-2174 NSF Grant

Descriptors: "Geochemistry, "Carbonates, "Bottom sediments, "Diagenesis, Connate water, Pore water, Trace elements, Leaching, Weathering, Carbonate rocks, Sedimentology, Water chemistry, Carbon, Limestones, Dolomite, Igneous rocks,
Identifiers: "Deep-sea oozes,

Unconsolidated cozes, partially lithified cozes, recrystallized limestones, dolostones and crystaline aragonite are found in the deep sea; chemical and isotopic analyses of these varieties are presented. The consolidated cozes and recrystalized limestones are low-Mg calcites and are often associated with basement rock detritus. Lithification arises from changes in the carbonate-equilibria system of the interstitial waters and results from chemical degradation of the igneous rocks. Lithification is accompanied by loss of Sr and a slight increase in B, Ba, Co, Cr, Ni and Y in most instances. The tuffaceous limestones are also low-Mg calcites, but are characterized by low Sr and relatively high B, Ba, Co, Cr, Ca, Ni, V, Y and Zn concentrations compared to the oozes. Three dolostones are of very different inotopic and chemical composition, possibly indicating three different pathways of dolomitization. One dolostone with depleted C-13 and high Ba concentration is probably derived from waters containing carbon from a fractionated organic source. Another variety of dolostone is characterized by low concentrations of Sr, B, Ba, Cu and Y and relatively high concentrations of Pb. Crystalline aragonite is commonly found in many areas associated with serpentinized periodotite. (Knapp-USGS)

Field 02-WATER CYCLE

Group 2J-Erosion and Sedimentation

THE POINT BAR ENVIRONMENT IN THE MACKENZIE RIVER DELTA, Alberta Univ., Edmouton. Dept. of Geography. D. Gill.

Canadian Journal of Earth Sciences, Vol 9, No 11, p 1382-1393, November 1972. 9 fig. 1 tab. 18 ref.

Descriptors: "Sedimentation, "Deltas, "Meanders, "Alluvium, "Canada, Particle size, Sediment sorting, Vegetation effects, Environment, Ecology, Succession, Forests, Acolian soils.
Identifiers: "Mackenzie River (Canada).

Helicoidal flow and sediment sorting along the coavex portion of shifting channels in the Mackenzie River Delta cause point bars to be composed of the coarsest material available to plant colonization. Sorting by aeolian action further reduces the fine fraction in point bar soils. Coarse-textured deposits maintain a lower water coatent and a higher soil temperature than other deltaic surfaces, thus nearly every point bar is colonized by a discrete plant association. This ecosystem is dominated by balsam poplar, and the distribution of well developed poplar stands is restricted to point bars. The successional ecology of this ecosystem is discussed in relation to the point bar environment. (Kanpp-USGS)

GUIDELINES FOR EROSION AND SEDIMENT CONTROL PLANNING AND IMPLEMENTA-

TION, Hittman Associates, Inc., Columbia, Md. For primary bibliographic entry see Field 04D. W73-01773

THE HISTORY OF LAKE GORBACZ, Polish Academy of Sciences, Bialystock. Dept. of Biology.

Identifiers: Plants, *Poland, Lakes, *Lake Gorbacz (Pol.), Chlorophyll, Organic matter, *Lake

The bed sediment of Lake Gorbacz (Biaystok District and Province) was studied with reference to its water, inactive chlorophyll, and organic matter contents. By comparing the findings with those of the palynological and plant remains on the peat bog of Gierasimow et al. (1957), an attempt was made to reconstruct the history of the lake, which was probably formed as a result of the last glacial period.—Copyright 1972, Biological Abstracts, Inc. W73-01893

2K. Chemical Processes

THE STRUCTURE OF LIQUID WATER, Leicester Univ. (England). Dept. of Chemistry. Por primary bibliographic entry see Field 01A. W73-01302

SOLUBILITY CHARACTERISTICS OF ROCKS, SOILS, AND MUD (GORNYYE, POCHVEN-NYYE ILLOVYYE RASTVORY), Akademiya Nauk SSSR, Novosibirsk. Institut Neorganicheskoi Khimii. Por primary bibliographic entry see Field 02G. W73-01325

HYDROGEOLOGY, HYDROCHEMISTRY, AND GEOTHERMAL STUDIES OF GEOLOGIC STRUCTURES (GIDROGEOLOGIYA, GIDROK-HIMIYA, GEOTERMIYA GEOLOGICHESKIKH STRUKTUR), Akademiya Navuk BSSR, Minsk. Institut Geokhimi i Geofiziki. For primary bibliographic entry see Field 02F. W73-01328

TRACE ELEMENTS IN SOILS, PLANTS, AND WATER OF THE SOUTHERN PART OF WESTERN SIBERIA (MIKROELEMENTY V POCHYAKH, RASTITEL'NOSTI I VODAKH YUZHNOY CHASTI ZAPADNOY SIBER). Novosibirak Iast. of Agrochemistry and Soil Science (USSR).

Izdatel'stvo 'Nauka' Sibirskoye Otdeleniye Novosibirsk, Kovalev, R. V., editor, 1971. 120 p.

Descriptors: "Trace elements, "Water, "Vegeta-tion, "Soils, Soil groups, Soil types, Soil profiles, Soil horizons, Soil analysis, Crops, Crop produc-tion, Plant morphology, Fertilizers, Metals, Boron, Surface waters, Groundwater, Meteorolo-gy, Forests, Grasslands. Identifiers: "USSR, "Siberia, Sod-Podzolic soils, Taiga, Lowlands, Plains, Plateaus.

Taiga, Lowlands, Plains, Plateaus.

New information is presented on the distribution and behavior of trace elements B, Mo, Cu, and Mn in soils, plants, and water in the taiga, forest steppe, and steppe zones of Western Siberia. Individual topics include: (1) manganese in soils of the southern part of Western Siberia; (2) copper and manganese in peat soils of the Baraba Lowlands; (3) boron in soils, plants, and water of the Kyshtovia Rayon of Novosibirsk Oblast; (4) trace elements in soils of the Omak Oblast; (4) trace elements in soils of the southern part of Western Siberia; (6) available boron in Gray Forest and Sod-Podzolic soils; (7) available copper and manganese in soils of Northern Kulunda; (8) molybdenum in wild plants of Tomak Oblast; (9) copper and manganese in natural waters of the Salair plain and mountain ridge; (10) effect of boron and molybdenum on crop yield of the Salair plain. (See also W73-01330 and W73-01331) (Josefson-USGS) W73-01329

BORON IN SOILS, PLANTS, AND WATER OF THE KYSHTOVKA RAYON IN NOVOSIBERSK OBLAST (BOR V POCHYAKH, RASTITEL'NOSTI I VODAKH KYSHTOVSKOGO RAYONA NOVOSIBERSKOY OBLASTI), NOVOSIBIRS KOY OBLASTI), NOVOSIBIRS KOY OBLASTI), AP. Anikina.

In: Mikroelementy v pochvakh, rastitel'nosti i vodakh yuzhnoy chasti Zapadnoy Sibiri; Izdatel'stoy 'Nauka' Sibirskoye Otdeleniye, Novosibirsk, p 28-37, 1971. 2 tab, 15 ref.

Descriptors: "Trace elements, "Boron, "Soils, "Vegetation, "Water, Surface waters, Groundwater, Water analysis, Soil groups, Soil types, Soil proporties, Soil horizons, Trees, Grasses, Clovers, Plant groupings, Plant physiology, Leaching, Sampline Sampling.
Sampling.
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The concentration of total boron in soils and plants of the Kyshtovka Rayon in northwestern Novosibirsk Oblast is high and approximates the boron content in soils and plants of nearby Baraba. The amount of available boron in the soils is very small. The low content of boron in groundwaters and surface waters of the region (0.03-0.20 mg/liter) is attributed to the negligible loss of this element through leaching. (See also W73-01329) (Josefson-USGS)

COPPER AND MANGANESE IN NATURAL WATERS OF THE SALAIR PLAIN AND MOUN-TAIN RIDGE (SODERZHANIYE MIKROELE-MENTOV MEDI I MARGANTSA V PRIROD NYKH VODAKH PRISALAIRSKOV RAVNINY I NIMA VUDAMI PRISALAIRSKUY RAVNINY I SALAIRSKOGO KRYAZHA), Novosibirak Inst. of Agrochemistry and Soil Science (USSR). A. A. Treyman.

In: Mikroelementy v pochvakh, rastitel'nosti i vodakh yuzhnoy chasti Zapadnoy Sibiri; Iz-datel'stvo 'Nauka' Sibirakoye Otdeleniye, Novosibirak, p 90-97, 1971. 4 tab, 6 ref.

Descriptors: "Trace elements, "Metals, "Copper, "Manganese, "Water, Surface waters, Ground-water, Water chemistry, Chemical properties, Soils, Forests, Grasslands, Sampling.
Identifiers: "USSR, "Siberis, "Novosibirsk Oblast, "Plains.

The average percentage of copper and manganese in surface waters and groundwaters of taiga and forest-steppe regions of the Salair plain in eastern Novosibirak Oblast approaches Clarke concentrations. The manganese content of groundwaters of the plain averages 0.123 mg/liter and is about ten times that of surface waters. The copper content of surface waters and groundwaters of the study area is approximately the same. The rate of manganese movement in dry residue of surface waters less than that in dry residue of groundwaters. Copper in surface waters and groundwaters exists under conditions favorable to its movement. (See also W73-01329) (Josefson-USGS)

GEOCHEMICAL CONTROLS OF GROUND-WATER QUALITY, Geological Survey, Menlo Park, Calif. J. D. Hem.

J. D. Hem.
Proceedings available from Engineering Pub. Office, Ill. Univ., 112 Engineering Hall, Urbana 61801; Price \$6.50. In: Proceedings of 14th Water Quality Conference on Groundwater Quality and Treatment, February 9-10, 1972, Illinois University Department of Civil Engineering, Urbana: University of Illinois Bulletin, Vol 69, No 120, p 7-18, May 26, 1972. 3 fig, 1 tab, 32 ref.

Descriptors: *Water quality, *Groundwater, *Water chemistry, Hydrogeology, *Calcium, Bicarbonatea, Hydrogen ion concentration, *Car-bon dioxide, Equilibrium, Weathering, Leaching, Sulfates. Identifiers: Groundwater quality.

Methods for evaluation of chemical factors that are of major importance in groundwater systems are still in early stages of development. Equilibrium chemical models coincide well with natural conditions for soluble derivatives of calcium carbonate and carbon dioxide. Where the temperature is nearly constant and the supply of carbon dioxide is controlled, the calcium, bicarbonate, and hydrogen ion concentrations are strongly constrained. Graphs summarizing the calculated relationships show increases in calcite solubility as functions of partial pressure of carbon dioxide, temperature and ionic strength, and the effect on calcium concentration and pH of the water. Solid-liquid interface effects are important in groundwater chemistry, but nonequilibrium chemistry and chemical kinetics have not yet been significantly utilized. (Knapp-USGS)

INFRARED SPECTROGRAPHY OF THE BITU-INFRARED SPECTROGRAPHY OF THE BAU-MENS EXTRACTED OF CALCIC HYDROMORPHIC SOILS, Poitiers Univ. (France). Faculte des Sciences. P. Jambu, T. Dupuis, and J. Dupuis. Sci Sol. 1970 (1): 31-41. Illus. 1970. English sum-

mary. Identifiers: *Bitumens, *Calcic hydromorphic soils, Carbon, Esters, Fatty-acids, Paraffins, Soils, *Infrared spectrography.

In a sequence of calcic hydromorphic soils, the rate of bitumens consist of about 4% of the total organic matter. Bitumens are more abundant in a hydromorphic and acidic medium. The bitumens are complex mixtures with a high rate of C. Their study by IR spectroscopy shows that they are essentially formed by aliphatic and sometimes un-

Chemical Processes—Group 2K

saturated chains (hydrocarbons, paraffins). Esters are mainly found with free fatty acids. The amount of the aliphatic esters seems to increase in the driest terms of the sequence whereas beazenic cycles are most numerous in the waterlogged beds of peat.—Copyright 1972, Biological Abstracts, Inc. W73-01392

COMPUTER-ASSISTED GAS CHROMATOG-RAPHY, Purdue Univ., Lafayette, Ind. For primary bibliographic entry see Field 07C. W73-01440

TRACE INORGANIC ANALYSIS, Missouri Univ., Kansas City. For primary bibliographic entry see Field 05A. W73-01441

QUALITY OF SURFACE WATER OF ESCAM-BIA AND SANTA ROSA COUNTIES, FLORIDA, 1963-72, Geological Survey, Tallahassee, Fla. L. J. Slack. Geological Survey Open-file Report 72015, 1972. 24 p, 1 fig, 1 tab, 6 ref.

Descriptors: "Water quality, Chemical analysis, "Surface waters, "Florida, "Data collections, Sampling, Water analysis, Water chemistry, Water properties, "Inorganic compounds, Organic compounds, Heavy metals, Trace elements, dentifiers: Escambia County (Fla), Santa Rosa

Collecting and publishing data on the chemical and physical quality of surface waters in Escambia and Santa Rosa Counties, Florida, is part of a state-Santa Rosa Counties, Florida, is part of a state-wide cooperative program that over the years has been sponsored by the U.S. Geological Survey, the Florida Bureau of Geology, the Florida De-partment of Transportation, the city of Pensacoia, and Escambia County. The quality-of-water data for the nine sites sampled are presented. In addi-tion to the tables of chemical analyses, the sigmificance and occurrence of the conswater are presented. (Woodard-USGS) W73-01458

PORE FLUID AND MINERALOGICAL STUDIES OF RECENT MARINE SEDIMENTS: BAUER DEPRESSION REGION OF EAST PACIFIC RISE, University of Southern California, Los Angeles. Dept. of Geological Sciences.
J. L. Bischoff, and F. L. Sayles.
Journal of Sedimentary Petrology, Vol 42, No 3, p 711-724, September 1972. 2 fig., 3 tab, 33 ref. NSF Grants 23495 USC, and GA25804 (Woods Hole).

Descriptors: "Pore water, "Bottom sediments, "Pacific Ocean, "Water chemistry, "Geochemistry, Diagenesis, Water analysis, Trace elements, Manganese, Silica, Chlorides, Potassium, Magnesium, Sulfates, Calcium carbonate, Solubility, Mineralogy, Connate water. Identifiers: East Pacific Rise.

Geochemical studies of sediments and pore fluids of recent deep sea sediments in the vicinity of the equatorial East Pacific Rise were carried out to delineate diagenetic and hydrothermal activity. Pore fluids were extracted onboard ship at in situ temperatures to yield the pore water data free of thermal artifacts. Dissolved Cl, S04, Mg, Ca, and K display remarkably few variations from bottom water concentrations even through various sediment types from CaC08 ooze to siliceous ooze, red clay, and 'hydrothermal' heavy metal muds. However, a few examples of earichment of K were noted. Dissolved Ma and SiO2, in contrast, displayed marked earichments, with solubilities Geochemical studies of sediments and pore fluids

likely controlled by rhodochrosite and sepiolite, respectively. No evidence for removals of dissolved components was found. (Knapp-USGS) W73-0146.

DISSOLUTION KINETICS OF CALCIUM CAR-BONATE IN SEA WATER: 1. SATURATION STATE PARAMETERS FOR KINETIC CALCIL

LATIONS, Yale Univ., New Haven, Conn. Dept. of Geology and Geophys physics. ary bibliographic entry see Field 02J.

DISSOLUTION KINETICS OF CALCIUM CAR-BONATE IN SEA WATER: II. A KINETIC ORIGIN FOR THE LYSOCLINE, Yale Univ., New Haven, Coan. Dept. of Geology and Geophysics. For primary bibliographic entry see Field 02J. W73-01488

DIFFUSION AND REACTION PROFILES OF DISSOLVED MANGANESE IN THE PORE WATERS OF MARINE SEDIMENTS, Edinburgh Univ. (Scotland). Grant Inst. of Geolo-

For primary bibliographic entry see Field 02J. W73-01489

COMPOSITIONAL VARIATIONS OF GASES IN TEMPERATE GLACIERS, Bern Univ. (Switzerland). Physikalisches Institut. For primary bibliographic entry see Field 02C. W73-01490

TRANSFORMATION OF MANGANESE IN A WATERLOGGED SOIL AS AFFECTED BY REDOX POTENTIAL AND PH, Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W73-01493

THE TRANSPORT OF CATIONS IN SOIL COLUMNS AT DIFFERENT PORE VELOCI-TIES, Utah State Univ., Logan. Dept. of Soil Science

and Biometeorology.
For primary bibliographic entry see Field 02G.
W73-01497

CHEMICAL COMPOSITION OF NATURAL WATERS IN THE VYG RIVER BASIN IN RELATION TO THE SOIL OF CENTRAL KARELIA (O KHIMICHESKOM SOSTAVE PRIRODNYKH VOD BASSEYNA R. VYG V SVYAZI S POCHVENNYM POKROVOM TSENTRAL'NOY KARELII), Akademiya Nauk SSSR, Moscow. Pochvennyi In-

For primary bibliographic entry see Field 02G. W73-01518

GEOCHEMISTRY OF FLUORINE IN WATERS OF CARBONIFEROUS DEPOSITS OF THE MOSCOW ARTESIAN BASIN (GEOKHIMIYA FTORA V VODAKH KARBONA MOSKOV-SKOGO ARTEZIANSKOGO BASSEYNA), Yu. I. Voroshilov. Izdatel'stvo 'Nedra', Moscow, 1972. 96 p.

Descriptors: "Geochemistry, "Fhaorine, "Ground-water, "Groundwater basins, "Artesian aquifers, Artesian wells, Hydrogeology, Structural geology, Stratigraphy, Geomorphology, Paleozoic era, In-organic compounds, Fluorides, Calcium, Agueous solutions, Water chemistry, Water quality, Public health, Potable water, Water supply.

ntifiers: *USSR, *Carboniferous period.

The areal distribution and geochemical characteristics of fluorine in groundwater of carboniferous aquifers of the Moscow artesian basin, which serves as a water-supply source for the Moscow, Kalinin, Smolensk, Kaluga, Tula, Ryazan', and Vladimir Oblasts are described. A large number of wells pumping from Middle and Lower Carboniferous aquifers in the Moscow and Ryazan' Oblasts yield fluoride concentrations of 4-6 mg/liter, which are considered excessive and harmful in drinking water. Considerable attention is given to the role of calcium in the migration of fluorine in in different groundwater types and to the grouping of groundwater quality data according to aquifers. (Josefson-USGS)

EQUILIBRIUM AND KINETIC SIMULTANE-OUS DETERMINATION OF SUL-FONEPHIALEIN DYE MIXTURES BY THE METHOD OF PROPORTIONAL EQUATIONS, Oklahoma State Univ., Stillwater. Dept. of Chemistry. For primary bibliographic entry see Field 05A. W73-01665

SPECTROELECTROCHEMICAL STUDIES OF METAL DEPOSITION AND STRIPPING AND
OF SPECIFIC ADSORPTION ON MERCURYPLATINUM OPTICALLY TRANSPARENT -FLATINUM OFFICALLY TRANSPAREN ELECTRODES, Ohio State Univ., Columbus. Dept. of Chemistry. For primary bibliographic entry see Field 05A. W73-01666

VARIATIONS IN QUALITY AND QUANTITY OF SLIMS RIVER WATER, YUKON TERRITO-RY, Michigan University, Ann Arbor. Dept. of Geog-For primary bibliographic entry see Field 02E.
W73-01732

CHEMISTRY OF GROUNDWATER IN IGNE-CHEMISTRY OF GROUNDWATER IN IGNE-OUS ROCK AT ANGERED, GOTHENBURG, Royal Inst. of Tech., Stockholm (Sweden). Dept. of Land Improvement and Drainage. For primary bibliographic entry see Field 02F. W73-01734

EARLY DIAGENESIS IN A REDUCING FJORD, SAANICH INLET, BRITISH COLUMBIA-III. CHANGES IN ORGANIC CONSTITUENTS OF SEDIMENT, TRW Systems Group, Redondo Beach, Calif. Biosciences and Electrochemistry Dept. For primary bibliographic entry see Field 02J.

A GEOCHEMICAL STUDY OF SOME LITHIFIED CARRONATE SEDIMENTS FROM THE DEEP-SEA, Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 02J. W73-01755

THE OCCURRENCE OF HIGH CO2 CONCENTRATIONS IN SOIL AIR,
Volcani Inst. of Agriculture Research, Bet-Dagan
(Israel). Dept. of Soils and Water.
For primary bibliographic entry see Field 02G.
W73-01760

MICROBIOLOGICAL STUDIES ON NITROGEN FIXATION IN AQUATIC ENVIRONMENTS: V. MODIFICATION OF ACETYLENE METHOD

Field 02-WATER CYCLE

Group 2K—Chemical Processes

FOR THE MEASUREMENT OF IN SITU RATE OF NITROGEN PIXATION, Mie Prefectural Univ., Tsu (Japan). Faculty of Fisheries. ary bibliographic entry see Field 05B. For primar W73-01857

ECOSYSTEM PROCESSES IN A STAND OF ULEX EUROPAEUS L.: IL THE CYCLING OF CHEMICAL ELEMENTS IN THE ECOSYSTEM, Commissioner for Economic Development, Agriculture and Natural Resources, Ibadan (Nigeria). For primary bibliographic entry see Field 05B. W73-01866

2L. Estuaries

INVENTORY REPORT—COLUMBIA-NORTH PACIFIC REGION, WASHINGTON AND OREGON. Corps of Engineers, Portland, Oreg. North Pacific For primary bibliographic entry see Field 08B.

A MATHEMATICAL MODEL PREDICTING TIDAL CURRENT VELOCITIES IN THE STRAIT OF GEORGIA-JUAN DE FUCA STRAIT SYSTEM, Victoria Univ. (British Columbia). Dept of Physics.
For primary bibliographic entry see Field 05B.
W73-01301

INVENTORY REPORT- ALASKA REGION. Corps of Engineers, Portland, Oreg. North Pacific For primary bibliographic entry see Field 08B. W73-01316

HUMAN WASTES AND THE CHESAPEAKE BAY, Maryland Environmental Service, Annapolis. For primary bibliographic entry see Field 05D. W73-01345

A FIELD STUDY OF FLOCCULATION AS A

A FIELD STUDY OF FLOCCULATION AS A FACTOR IN ESTUARIAL SHOALING PROCESSES, Corps of Engineers, Washington, D.C. Committee on Tidal Hydraulics.

R. B. Krone.

Army Engineer Waterways Experiment Station, Technical Bulletin no. 19, June 1972, 62 p, 4 app (App. D in separate vol).

Descriptors: *Estuaries, *Flocculation, *Sediments, *Shoals, *Tides.
Identifiers: *Savannah Harbor, *Shoaling

In order to learn the importance of flocculation processes to the formation of shoals, simultaneous measurements of currents, salinities, and suspended sediment concentrations were made at locations upstream, inside, and downstream of an area of rapid shoaling in Savannah Harbor throughout a tidal cycle during each of three tide ranges. The sampling stations were located in the zone of mixing of the river and ocean waters. Data show that chemical and hydraulic conditions prevail that provide the cohesion, frequency of collision, and time for formation necessary to form aggregations of large numbers of mineral particles. Flocculation determines the settling velocities of suspended material at Savannah. The data also provide information on deposition and scour of sediment materials. Control of shoaling in such areas depends upon means to reduce suspended

sediment inflow, to increase sediment outflow, and to maintain sufficient bed shears to keep sediment in motion. Appendixes A, B, and C present data from field studies, aketches of the bottom sensor and data from shoal sample analyses. Appendix D (in separate volume) presents velocities, salinities, and suspended solids from field measurements and samples. (Spivey-WES) W73-01387

FOWL RIVER, MOBILE BAY, ALABAMA, NAVIGATION (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Mobile, Ala.

For primary bibliographic entry see Field 08A.

W73-01393

MISSION BAY ENTRANCE CHANNEL DREDGING, SAN DIEGO RIVER AND MISSION BAY, SAN DIEGO COUNTY, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATE-

(DKAFT ERVIRORMENTAL IMPACT STA MENT). Army Engineer District, Los Angeles, Calif. For primary bibliographic entry see Field 04A. W73-01397

ST. CATHERINE SOUND, MARYLAND (MAIN-TENANCE DEEDGING) (DRAFT ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, Baltimore, Md. For primary bibliographic entry see Field 04A. W73-01411

THE ECOLOGICAL ENERGIES OF GROWTH, RESPIRATION AND ASSIMILATION IN THE INTERTIDAL AMERICAN OYSTER, CRASSOS-TREA VIRGINICA (GMELIN), South Carolina Univ., Columbia. For primary bibliographic entry see Field 05C. W73-01437

THE ORGANIC GEOCHEMISTRY OF HYDROCARBONS IN COASTAL ENVIRON-MENTS, Texas Univ., Austin. For primary bibliographic entry see Field 05B. W73-01439

STRUCTURAL AND FUNCTIONAL ASPECTS OF A SUBLITTORAL COMMUNITY, Georgia Univ., Athens.
For primary bibliographic entry see Field 05C.
W73-01443

THE BENTHIC MACROFAUNA OF GREEN BAY, LAKE MICHIGAN, Wisconsin Univ., Madison. For primary bibliographic entry see Field 05C. W73-01453

THE NATURE AND OCCURRENCE OF HEAVY MINERALS IN PLEISTOCENE AND HOLOCENE SEDIMENTS OF THE LOWER GEORGIA COASTAL PLAIN, Unit of Coastal Sedimentation, Taunton (England). For primary bibliographic entry see Field 02J. W73-01466

RESUSPENSION OF ESTUARINE SEDIMENTS BY SMALL AMPLITUDE WAVES, New Hampshire Univ., Durham. Dept. of Earth Sciences; and New Hampshire Univ., Durham. Jackson Estuarine Lab. F. E. Anderson.

Journal of Sedimentary Petrology, Vol 42, No 3, p 602-607, September 1972. 5 fig, 1 tab, 14 ref. Descriptors: *Suspended load, *Estuaries *Waves (Water), *New Hampshire, Tides, Cur rents (Water), Sediment transport, Sampling.

Resuspension of fine-grained estuarine sediments by small amplitude waves was quantitatively determined in the Greay Bay estuary of New Hampahire. By examining the relationship between wave height and sediment concentration a linear equation was calculated for shallow waters on the flooding tide. Residence time of resuspended sediment is low, with most resuspended sediment removed from the water within a 24-hour period. (Knapp-USGS) W73-01469

TIDAL CURRENT CONTROL OF SEDIMENT DISTRIBUTION IN NORTHUMBERLAND STRAIT, MARITIME PROVINCES, Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab. K. Kranck. Journal of Sedimentary Petrology, Vol 42, No 3, p 596-601, September 1972. 4 fig, 18 ref.

Descriptors: "Sediment transport, "Tides, "Distribution patterns, "Straits, "Currents (Water), Canada, Bottom sediments, Mud, Particle size, Velocity, Settling velocity, Channels.
Identifiers: Northumberland Strait (Canada).

In Northumberland Strait (Canada), muddy sediments are being deposited in areas with maximum tidal current speeds of less than 0.5 knots while sands and gravels occur in areas where currents are stronger than this. There is a direct relationship between the median diameter of bottom sediments and maximum tidal current speeds. Tidal current asymmetries occur; the speed and duration of the ebb and flood currents differ. Langrangian and Eulerian types of asymmetries are distinguished. Tidal current asymmetries and the presence of a residual current cause a difference in the amount of sediment transported in the ebb and in the flood direction and hence a net sediment transport. (K-napp-USGS)

PEDIMENTS AND PEDIMENT-FORMING PROCESSES, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 02J. W73-01472

RECENT MARINE SEDIMENTS OF LAN-CASTER SOUND, DISTRICT OF FRANKLIN, Bedford Inst., Dartmough (Nova Scotin). Atlantic Geoscience Center. D.E. Buckley. Maritime Sediments, Vol 7, No 3, p 96-117, December 1971. 28 fig, 22 ref.

Descriptors: *Sedimentation, *Arctic, *Particle size, *Provenance, *Currents (Water), Sounds, Bottom sediments, Straits, Sampling, Stratigraphy, Sediment transport, Sedimentology, Distribution patterns, Oceanography. Identifiers: *Lancaster Sound (Canada).

Textural and petrographic criteria are useful in deducing the environment of deposition of marine sediments, provided appropriate consideration can be given to the mode of transportation and energy conditions of the transporting medium. Textural attributes of recent sediments from Lancaster Sound, an Arctic marine basin, were examined to evaluate the relationships to dispersal processes. From late October to early March each year, Lancaster Sound is from 80% to 100% covered with the c. By August the sound is largely free of ice except for occasional bergs drifting easterly. All current velocities range from less than 0.5 knots at the surface to less than 0.1 knot at depth. The near-random distribution of coarse sediments (Larger

WATER SUPPLY AUGMENTATION AND CONSERVATION-Field 03

Saline Water Conversion—Group 3A

than 0.15 mm) in Lancaster Sound is best explained by ice-rafting processes. Sediment transport by current action is restricted to the sizes (less than 0.15 mm) which can be maintained in suspension. The increased percentages of most heavy minerals in the northeast are probably due to the greater exposure of the source rocks to erosional processes. The enriched carbonate content in marine sediments along the southern coast reflect source areas with larger amounts of carbonate minerals. (Knapp-USGS) W73-01492.

GUIDE TO USERS OF GROUND WATER IN BAY COUNTY, FLORIDA, Geological Survey, Taliahassee, Fla. For primary bibliographic entry see Field 07C. W73-01502

TIDAL CURRENT TABLES, 1972, ATLANTIC COAST OF NORTH AMERICA. National Ocean Survey, Rockville, Md. For primary bibliographic entry see Field 07C. W73-01506

SEDIMENT LOADS IN CANALS 18, 23, AND 24 IN SOUTHEASTERN FLORIDA, Geological Survey, Tallahassee, Fla. W. A. J. Pitt, Jr. Geological Survey Open-file Report 72013, 1972. 48 p. 16 fig. 6 tab. 5 ref.

Descriptors: *Sediment transport, *Sediment load, *Canals, *Florida, *Data collections, Stramflow, Rainfall, Runoff, Discharge measurement, Flow rates, Sediment discharge, Correlation analysis, Curves, Water quality, Chemical analysis, Sediment yield, Estuaries.

Identifiers: St. Lucie River estuary, Loxahatchee

River estuary.

Suspended-sediment concentrations and suspended-sediment discharges were determined in selected canals in St. Lucie, Martin, and Palm Beach Counties, in southeastern Florida. Sediment rating curves were developed to relate water discharge to sediment concentration at the three sites sampled. An evaluation of the concentration and sediment loads shows that larger amounts of suspended sediment were being carried into the St. Lucie River estuary than were being carried into the Loxahatchee River estuary. Peat and muck soils in areas drained for agricultural planting and citrus cultivation are readily carried by runoff waters into the major canals that traverse the region. Data were collected during a normally high discharge period, July to November, 1969, from Canals 23 and 24, which discharge into the St. Lucie River estuary, and from Canal 18, which discharges into the Loxahatchee River estuary. (Woodard-USGS)

HYDROLOGY OF THE TEREK AND SULAK RIVER ESTUARIES (GIDROLOGIYA UST-'YEVYKH OBLASTEY REK TEREKA I SU-

LAKA),
State Oceanographic Inst., Moscow (USSR).
S. S. Baydin, N. A. Skriptunov, B. S. Shteynman, and G. N. Gan.
Gosudarstvennyy Okeanograficheskiy Institu

Gosudarstvennyy Okeanograficheskiy Institut Trudy, No 109, Moscow, 1971. 200 p.

Descriptors: "Hydrology, "Estuaries, "Estuarine environment, "Littoral, "Rivers, Deltas, Sediments, Sediments, Sediments, Sediments, Channels, Channels, Channelmorphology, Currents (Water), Water balance, Water levels, Water properties, Salinity, Streamflow, Runoff, Geomorphology, Meteorology, Fluctuations.

Identifiers: "Ussr, "Terek River, "Sulak River, Dagestan ASSR, Caspian Sea.

This three-part monograph is a continuation of estuarine research begun in the USSR in 1936 by the State Oceanographic Institute. Hydrologic processes occurring in the Terek and Sulak River estuaries and littoral zone of the Caspian Sea near the Agrakhanskiy Peninsula in Dagestan ASSR are investigated for delta development, channel dynamics, and rational utilization of natural resources. The physical attributes emphasized are river flow and sediments in the estuaries, and water levels, currents, salinity, and temperature in the littoral zone. (Josefson-USGS)

REDUCING AND RETARDING VOLUME AND VELOCITY OF A LIQUID FREE-FLOWING IN ONE DIRECTION, Tecnico, Inc., Washington, D.C. (assignee) For primary bibliographic entry see Field 08A. W73-01542

HARBOR DREDGING PRESENTS ANOTHER WASTE DISPOSAL PROBLEM. For primary bibliographic entry see Field 05E. W73-01645.

USING COASTAL ZONE MODELS TO PRE-DICT ENVIRONMENTAL IMPACT, EG and G, Inc., Waltham, Mass. Environmental Equipment Div., wantnam, Mass. Environme For primary bibliographic entry see Field 05C. W73-01650

SURFACE ZOOPLANKTON FROM AUKE BAY AND VICINITY, SOUTHEASTERN ALASKA, AUGUST 1962 TO JANUARY 1964, National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Fisheries Lab. For primary bibliographic entry see Field 05A. W73-01677

THERMAL POLLUTION OF A TROPICAL MARINE ESTUARY, Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla. For primary bibliographic entry see Field 05C.

A UTILITY SPONSORED ENVIRONMENTAL SURVEILLANCE AND RADIOECOLOGICAL RESEARCH PROGRAM FOR A COASTAL NUCLEAR FOWER FLANT, Florida Univ., Gainesville. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05B. W73-01718

RESEARCH RELATED TO THE PREDICTION OF TEMPERATURE AT A POWER REACTOR SITE ON THE LOWER COLUMBIA RIVER. Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs. For primary bibliographic entry see Field 05B. W73-01720

HYDRODYNAMIC CHANGES IN THE CHES-APRAKE BAY, Hampton Roads Sanitation District, Norfolk, Va. For primary bibliographic entry see Field 05C. W73-01730

HEAVY METALS-AN INVENTORY OF EXIST-ING CONDITIONS, Virginia Inst. of Marine Science, Gloucester Point. For primary bibliographic entry see Field 05B. W73-01731 THE POINT BAR ENVIRONMENT IN THE MACKENZIE RIVER DELTA, Alberta Univ., Edmonton. Dept. of Geography. For primary bibliographic entry see Field 02J. W73-01756

GENERAL PRELIMINARY CONTRIBUTION TO THE PLANKTON OF EGYPT, Alexandria Inst. of Oceanography and Fisheries (Egypt). For primary bibliographic entry see Field 02H. W73-01867

THE INFLUENCE OF SALINITY ON THE RATE OF PHOTOSYNTHESIS AND ABUNDANCE OF SOME TROPICAL PHYTOPLANKTON, Central Marine Fisheries Research Inst., Cochin (India). S. Z. Qasim, P. M. A. Bhattathiri, and V. P. Devassy. Mar Biol (Berlin). Vol 12, No 3, p 200-206. 1972. Il-

Identifiers: Diatoms, Dinoflagellates, *Photosynthesis, *Phytoplankton, *Salinity, Tropical, Estuaries, *India.

Several species of phytoplankton (3 dinoflagellates, 9 diatoms) were grown in unialgal, but not bacteria-free, cultures. These clones when exposed to varying salinities, from 5 to 35%, showed a marked increase in their rates of photosynthesis at low salinities. The optimum requirement of alinity, however, varied in different species. Observations on the relative abundance of phytoplankton in an estuary, where the salinity changes were fairly large, confirmed that, within limits, waters with low salinities support a greater abundance of phytoplankton in nature. The wide adaptability of phytoplankton to changes in salinity corresponds to the conditions brought about by the monsoon system along the southwest coast of India, where large dilutions are associated with the enrichment of water with nutrients.—Copyright 1972, Biological Abstracts, Inc.

GOLDEN ISLES' MAY FIGURE IN WORLD HERITAGE TRUST,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

NEW REVERSE OSMOSIS SYSTEM DESIGNED FOR LONG LIFE AND HIGH PERFORMANCE.

Power Engineering, Vol 75, p 66, June 1971.

Descriptors: "Reverse osmosis, "Membranes, "Desafination, Brackish water, Operating costs, Membrane processes.

A new Westinghouse reverse oamosis system is said to deliver the same volume of product at half the operating pressure of existing systems. Modular arrangements from 200 gpd to one million appear on more can be made. The unique membrane support system consisting of a resin-bonded sand core has a high permeability for low product-side pressure drop. Advantages include longer membrane life, lower power consumption, lower pump, valve and gasketing maintenance costs, and quick cleaning. The tubular system is suited for desaling brackish water and purifying and separating industrial waste but the cellulose acetate membrane will hydrolize above a pH of 9. (Anderson-Texas) W73-01355

FIAIN 03-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3A-Saline Water Conversion

EFFECT DISTILLATION MULTIPLE

SYSTEMS, Aeroiet-General Corp., El Monte, Calif. (as-

signce).
D. D. Kays.
U. S. Patent No 3,672,960, 4 p, 2 fig, 14 ref; Official Gazette of the United States Patent Office, Vol 899, No 4, p 1483, June 27, 1972.

Descriptors: *Patents, *Distillation, *Potable water, *Desalination, Water purification, Water treatment, Water quality control, Evaporation, Condensation, Equipment.

In this distillation system, several serially inter-connected evaporator effects are arranged with a preheater having at least two stages for one or more of the effects. Concentrate and condensate from the serially arranged effects or from previous feed heater stages are flashed or spontaneously evaporated in the presence of the feed liquor to form a vapor which heats the feed liquor. The remaining liquid is cooled to the saturation tem-perature in the feed heater stage. (Sinha-OEIS) W73-01529

DESALINATION OF SEA WATER.

B. S. Frank. U. S. Patent No 3,670,897, 3 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 899, No 3, p 972, June 20, 1972.

Descriptors: "Patents, "Desalination, Sea water, Saline water, Potable water, Water treatment, "Osmosis, "Membranes, "Semipermeable mem-branes, Equipment, Chemical precipitation.

A semipermeable membrane separates the apparatus into two sections. The first is a saline water chamber, and the second a chamber having a concentrated solution of an intermediate or precipitable soluble salt, such as aluminum sulfate. Presh water will pass from the saline or sea water to the salt solution without the use of pressure. The excess concentrated salt solution in the second chamber passes to a third chamber or place where salt is removed by being brought into contact with a precipitant such as calcium hydroxide. (Sinha-OEIS)

PROCESS FOR DEIONIZING WATER, Rohm and Haas Co., Philadelphia, Pa. (assignee). For primary bibliographic entry see Field 05D. W73-01563

THE ECONOMIC VALUE OF WATER QUALI-TY. Metcalf and Eddy, Inc., Palo Alto, Calif. For primary bibliographic entry see Field 05F. W73-01679

ECONOMICS OF ION EXCHANGE TECHNOLOGY APPLIED TO MUNICIPAL WATER QUALITY IMPROVEMENT, Bresler and Associates, Inc., New York. S. A. Bresler.

S. A. Brester.

For sale by the Superintendent of Documents,
U.S. Government Printing Office, Washington,
D.C. 20402 Price \$1.50. Office of Saline Water
Research and Development Progress Report No.
781, June 1972. 181 p, 29 fig, 98 tab, 21 ref. 14-01-

Descriptors: "Water quality, "Treatment, "Ion exchange, "Feasibility, "Cost analysis, "Cost methodology, Reverse osmosis, Brines, Economics, 'Desalination, "Municipal water. Identifiers: TriplEx process, QuadruplEx process, X-R process, "Brine regeneration.

An investigation was conducted of the utility of application of ion exchange technology and combinations of ion exchange and reverse osmosis

technology for the partial desalting of brackish water. During the course of the study three basic processes were derived and costed for applications to a spectrum of brackish water supplies ranging from the quality used at Gallup, N.M. (brackish) to that used at Las Animas, Colorado (very brackish). The three processes have been designated: (1) TriplEx, which employs three ion exchange beds in series; (2) QualrupEx, utilizing four ion exchange beds; and (3) the X-R process, which employs ion-exchange softening followed by reverse osmosis desalting. The detailed application of these systems to twelve Western municipalities is presented. The economic assessments indicate that these water quality improvement systems will, for a number of the candidate feedwaters for which the processes were considered as compared to other desalting processes such as reverse osmosis and electrodialysis, result in cost savings over the alternatives. However, these conclusions are preliminary, as the derived systems have not yet been proven by field tests. (OSW abstract)

THERMODYNAMICS AND KINETICS IN THE HYDRATE AND FREEZING PROCESSES, Syracuse Univ. Research Inst., N.Y.
R. Fernandez, W. W. Carey, A. T. Bozzo, and A. J. Barduhn.

R. Fernandez, W. V. Carey, A. T. Bozzo, and A. J. Barduhn.
Available from the National Technical Information Service as PB-210 545, \$7.00 in paper copy, \$0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 229, January 1967. 70 p., 22 fig., 28 tab, 75 ref., 3 append. 14-01-0001-343.

Descriptors: *Desalination, *Freezing, *Ice, *Hydrate processes, *Thermodynamics, Sodium chloride, Solubility, Kinetics.

Experimental data obtained for ice-growth rates at different water velocities can be correlated by means of a simple physical model. The model assumes that the growth is heat transfer controlled, that all the heat is transferred to the liquid by convection and that the ice platelet grows with the maximum possible velocity. The correlation seems to be very good for the higher water velocities studied, while at the lower velocities conduction of heat through the ice may have to be taken into account. The conclusion that the growth rate varies with delta T3/2 in a purely heat transfer controlled process is of primary importance. The solubility of F-142b (CH3/CCI F2) has been measured in sodium chloride solutions. The experimental results are given, together with solubility equations, activity coefficients, and heats of solution. The thermodynamics and composition of chlorine hydrate were studied. (OSW abstract)

SPRAY FREEZING PROCESS, Cornell Univ., Ithaca, N.Y. D. S. Hubbard, J. P. Leinroth, and H. F. Weigandt. Available from the National Technical Informa-tion Service as PB-210 556, 55.75 in paper copy, 50.95 in microfiche. Office of Saline Water Research and Development Progress Report No 312, June 1968. 63 p, 22 fig, 9 tab, 51 ref, append. 14-01-0001-1141.

Descriptors: *Desalination, *Freezing, *Ice, Nucleation, Crystallization, Porosity. Identifiers: *Spray freezing, Methylene chloride.

The formation of ice beds from crystals produced The formation of ice beds from crystals produced by the spray freezing of 3.0 percent sodium chloride brines with methylene chloride refrigerant was investigated in pilot scale equipment. The ice beds were found to be highly compressible. Beds were characterized by pressure drop measurements while the bed was being formed. Permeability (K) and specific resistance (1/K) were determined. The local specific resistance increased essentially linearly with distance inside the bed, up to filtration pressures of 1.5 atmospheres. The nature of the ice produced was influenced to a remarkably small extent by changing any of the operating conditions. The nature of the ice produced was not influenced to a significant extent by conversion level, or by the rate of ice production. The crystal size was increased to a minor extent by changing from single-stage operation to two-stage operation. Equivalent particle diameters were found to be in the range of 0.035-0.045mm. Measuring pressure drop by circulating brine through established beds was not possible because channeling always took place near the periphery of the bed. For this reason pressure drop measurements were made across the bed during bed formation. Although established beds were found to be unstable, beds were inherently stable during the period they were being formed from the ice-brine slurry. (OSW abstract) W73-01682

INTERMOLECULAR PORCES IN SYSTEMS CONTAINING WATER, California Univ., Berkeley.

California Univ., Berkeley.

J. M. Prausnitz.

Available from the National Technical Information Service as PB-210 535, 35.75 in paper copy, 80.95 in microfiche. Office of Saline Water Research and Development Progress Report No 306, January 1968. 70 p, 7 tab, 16 fig. 14-01-0001-665.

Descriptors: "Theoretical analysis, "Water vapor,
"Water properties, Argon, Hydrogen bonding,
Methane, Molecular structure, Water structure,
Nitrogen, "Desalination,
Identifiers: Nonpolar gases, Statistical mechanics,
Water molecules, Water solubility.

Water molecules, Water solubility.

Theoretical and experimental studies were conducted toward establishing fundamental knowledge concerning intermolecular forces between water molecules and between water molecules and between water molecules and between water molecules and nonpolar molecules such as argon, nitrogen and methane. The vapor-phase solubility of water was measured in compressed nitrogen, argon and methane at 25 deg, 50 deg, 75 deg, and 100 deg C and at various pressures between 20 and 100 atmospheres. The volumetric properties of the vapor mixtures were described by the virial equation of state and second virial cross coefficients were obtained from the solubility data. Vapor-phase diffusion studies were conducted in a modified Stefan apparatus. The diffusivity of water in argon and in nitrogen was measured in the temperature region 25-80 deg C. Analysis of new and previously published experimental data suggests that a good representation of water-water and water-nonpolar gas interactions is given by the Open-chain dimer model and by the Kihara-Stockmayer potential function with the following parameters for water: e/k = 160 deg K, o = 2.65 deg A, and a* = 0.10. (OSW abstract)

AN ANALYSIS OF COUNTERWASHERS FOR FREEZE-DISTILLATION DESALINATION, Massachusetts Inst. of Tech., Cambridge. Joseph Shwartz, and Ronald F. Probstein. Available from the National Technical Information Service as PB-210 534, 33.00 in paper copy, 50.95 in microfiche. Office of Saline Water Research and Development Progress Report No 294, January 1968. 42 p., 10 fig, 16 ref. 14-01-0001-1294.

Descriptors: "Desalination, "Freezing, "Ice, Distillation. Identifiers: "Counterwasher, Wash column, Darcy's law, Ice crystals.

A hydrodynamic model based on Darcy's law is developed for counterwashers of the type used in washing brine from ice crystals. In the model the

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Saline Water Conversion—Group 3A

brine is displaced by fresh water from the in-terstices of the ice plug. Similarity parameters which can be used for comparing the performance of different counterwashers are derived. Both analytic and numerical solutions are presented. The production rate of fresh water is found, for example, to increase with decreasing the ice plug length below the screens and increasing ice crystal size, the ice plug length above the screens, the concentration of ice crystals in the slurry, and wall friction. Design criteria are presented for minimizfriction. Design criteria are presented for minimiz-ing the capital cost for a given production rate. W73-01684

THE PISTON BED AND ITS DESIGN,

Cornell Univ., Ithaca, N.Y. H. F. Wiegandt, R. L. Von Berg, and J. P.

Leunton.

Available from the National Technical Informa-tion Service as PB-210 553, \$5.50 in paper copy, \$0.95 in microfiche. Office of Saline Water Rearch and Development Progress Report No 290, January 1968. 57 p. 15 fig. 1 tab. 15 ref. 14-01-0001-1141.

Descriptors: *Desalination, *Freezing, *Ice, *Design criteria.
Identifiers: *Piston bed, *Counterwasher, Wash

The piston-bed column has been used extensively for countercurrent washing of solids. An electrical analog technique is developed and then applied in eighteen variations of rectangular piston-bed columns to illustrate this method of analysis. The piston bed is viewed simply as a moving, porous bed acting as a free piston which is constantly being cut off at one end and replenished at the other. For a vertical column containing an upother. For a vertical column containing an up-wardly moving ice bed, a drainage port is provided at an intermediate level. In a properly operating column, brine flows upward and wash water downward, each toward the drainage port; and washed ice is removed. A good design permits recovery of washed ice with little net loss of water for washing. The analogs permit a rapid and accu-rate appraisal of a conceptual design. Examples of both pressure and streamline analogs show the broad utility of the method. A dimensionless ice velocity, Vi, is used to characterize column per-formance. It is the ratio of the actual ice velocity to whatever lineal, gravity, drainage-rate of water formance. It is the ratio of the actual ice velocity to whatever lineal, gravity, drainage-rate of water is characteristic for the bed in question. Thus definitive designs are possible without the requirement for empirical knowledge of the crystal system. Of the designs presented the lowest Vi is 0.56 and the highest is 1.83. Advantages result from the use of contoured top surfaces, wide drainage-ports, unflooded drainage-ports, and hydraulic forces greater than gravitational to achieve ice rates much higher than those possible in early designs. The relationship between the crystallization step and washing may be significantly influenced by improved piston-bed columns. (OSW abstract) W73-01685

THE FREEZING PROCESS FOR DESALTING

SALINE WATERS,
Syracuse Univ. Research Inst., N.Y.
R. G. Latini, O. S. Rouher, P. D. Agrawal, and A.

J. Barduhn.

Available from the National Technical Information Service as PB-210 552, \$5.75 in paper copy, \$0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 282, December 1967. 66 p, 15 fig, 15 tab, 38 ref. 14-

Descriptors: *Desalination, *Freezing, *Ice, Hydrate processes, *Porous media, Saline water, Separation techniques. Identifiers: Anisotropy, Porous beds, a-Butane,

Three areas of investigation were pursued as follows: (1) Anisotropy in Porous Media: The separation of ice or hydrate particles from brine in the crystallization processes for desalting saline waters is accomplished by a wash column, the design of which depends upon a knowledge of mass transfer and fluid mechanics in porous media. It has normally been assumed that the permeability of these crystal beds is the same in all directions, but this study begins to examine that assumption by measuring the directional permeabilities of particle beds formed by sedimentation, which latter process would seem inevitably to produce anistropic beds, if the particles are not regular in shape. A new apparatus has been constructed for measuring permeabilities of such beds in two directions. Two main conclusions have been reached. First, all beds formed with samples of crushed limestone show definite anisotropic behavior. The differences in directional permeabilities are about 20% less than the horizontal values. Second, mechanical shaking of the beds to the smallest volume invariably reduces the extent of anisotropy, probably because it alters the natural orientation of the particles, yielding a more random packing. As a consequence, the differences in directional permeabilities decreased if the natural orientation of the particles, yielding a more random packing. As a consequence, the differences in directional permeabilities decreased by as much as one half. (2) n-Butane and Isobutane Hydrates: Work on normal and isobutane hydrates is not yet complete, but a phase diagram for isobutane hydrate in pure water is presented and the approximate heat of formation at the critical decomposition temperature and pressure (1.95 deg C and 1260 mm Hg) is calculated to be 28,500 cal/mole.

(3) Dispersion and Adsorption in Porous Madio-1200 mm Hg) is calculated to be 28,500 cal/mole.

(3) Dispersion and Adsorption in Porous Media: Results from the runs in packed bed giving similar adsorption constants to those in stirred batch systems is encouraging, since it means the model of the packed bed is reasonably accurate.

W73-01686

VAPOR FLOW LIMITATIONS IN A MELTER-

VAPOR FLOW LIMITATIONS IN A MELTER-CONDENSER,
Massachusetts Inst. of Tech., Cambridge.
P. L. T. Brian, K. A. Smith, and L. W. Petri.
Available from the National Technical Informa-tion Service as PB-210 551, 33.00 in paper copy,
30.95 in microfiche. Office of Saline Water Research and Development Progress Report No
269, September 1967. 15 p, 1 fig, 2 tab, 8 ref. 14-01-0001-546.

Descriptors: *Desalination, *Freezing, *Ice. Identifiers: Melter-condenser, Melter, Condenser, Darcy's law.

A simple model has been used to analyze the ex-A simple motion has been used to adaptive the ex-tent to which vapor flow restrictions within a packed, drained bed of ice crystals limits the rate of melting of the ice by direct contact condensa-tion of the vapor. The results indicate that vapor flow restrictions are quite limiting, the vapor hav-ing access to only the outermost 1/100 of an inch of ice bed for the case of low pressure water vapor of ice bed for the case of low pressure water vapor condensation and only the outermost inch of the bed for atmospheric pressure butane vapor condensation. This severe inaccessibility of the inner regions of the ice bed to the condensing vapor has apparently not been recognized previously, and yet it is obviously very important to the design and scale-up of the melter-condenser unit in a freeze-desalination plant. (OSW abstract)

FOAM FRACTIONATION OF INORGANIC SOLUTIONS,

Horizons Inc., Cleveland, Ohio. J. J. Bikerman.

J.J. Bikerman.
Available from the National Technical Informa-tion Service as PB-210 549, \$3.75 in paper copy, \$0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 248, April 1967. 30 p, 5 fig, 18 tab, 12 ref. 14-01-0001-759.

Descriptors: "Foam fractionation, "Ion flotation, "Desalination, "Iron, "Manganese. Ideatifiers: "Surface active agents, "Bubble diameter.

To explore the possibility of foam fractionation of inorganic salt solutions, such as sea water, the persistence of single bubbles on aqueous solutions of sodium chloride, sodium bromide, sodium sulfate, potassium chloride, magnesium chloride and two mixtures of NaCl and MgCl2 was measured. This persistence usually was between 0.08 and 1 second, that is much smaller than reported in earlier publications; arguments are presented for the greater probability of the new results to be more correct than the old. The bubble persistence was little affected by the nature of the salt. It slightly increased with the salt concentration. It was almost independent of the bubble diameter as long as this was in the range of 20 to 600 microns but was significantly greater at greater diameters (800 to 1300 microns). The effect of bubble diameter on persistence in these systems is very different from that observed on films of soap-like substances. It seems possible to account for this difference by pointing out that (1) the soap films are more uniform than the liquid films between a rising bubble and the free surface of a poorly foaming liquid, and (2) the soap films have three defensive mechanisms and, consequently, require an external agent for rupture while no defensive mechanism is known in solutions such as salt water. (OSW abstract)

DESALINATION BY ELECTROSORPTION AND

DESORPTION, Southern Research Inst., Birmingham, Ala. R. E. Lacey.

R. E. Lacey.

Available from the National Technical Information Service as PB-210 544, \$6.75 in paper copy, \$0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 228, January 1967. 85 p, 11 tab, 23 fig. 14-01-0001-

Descriptors: *Desalination apparatus, *Desalination processes, *Electrodialysis, Brackish water, Calcium sulfate, Cost analysis, Cost comparisons, Desalination, Permselective membranes, Scaling, Water treatment.

Research was continued on the electrosorption process, a cyclic process in which ions are first sorbed into special three-layer membranes under process, a cyche process in which ions are first sorbed into special three-layer membranes under the influence of a driving voltage to remove ions from water, and then desorbed from the membranes to regenerate them. The studies included the development of electrosorption membranes, the development of electrosorption stacks, the determination of optimum levels of process variables, and the development and validation of mathematical expressions that describe desalination performance. The experimental results indicated that the process has a number of advantages compared with conventional electrodial-ysis: (1) Higher current density is possible because precipitation of insoluble salts such as calcium sulfate, even though it occurs, does not interfere with the process; and (2) Extensive gasketing and manifolding is unnecessary; hence lower membrane replacement costs are possible because nearly one-third more membrane area can be utilized. (OSW abstract)

NUCLEATION AND GROWTH OF ICE CRYSTALS,

CRYSTALS,
Rocketdyne, Canoga Park, Calif.
John Farrar, and W. R. Yates.
Available from the National Technical Information Service as PB-210 540, \$4.75 in paper copy,
\$0.95 in microfiche. Office of Saline Water
Research and Development Progress Report No
219, November 1966. 49 p. 18 fig. 4 tab, 32 ref, append. 14-01-0001-333.

Field 03-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3A-Saline Water Conversion

Descriptors: *Desalination, *Freezing, *Ice, Ions, Surfactants, Solutes, Heat transfer, Morphology. Identifiers: Crystal growth.

Identifiers: Crystal growth.

The influence of ions, surfactants, and other selected solutes on the growth velocities of ice has been determined. Although the mechanism of freezing is dominated by heat transfer and hydrodynamic considerations, it is clear that certain species do modify the growth velocity to some degree. One cationic surfactant reduced growth rates along the A-axis. No substance increased growth velocities to any extent nor was a change in crystal habit affected. Reasons for the ice morphology and postulated growth mechanism are given. The importance of fluid flow on growth rates and on ion distribution at ice surfaces was demonstrated and correlated with theory. It was shown that natural convection increases ice growth at even moderate undercoolings. As a result, the velocity of ice dendrites was found to be more temperature dependent than previously supposed. (OSW abstract)

INVESTIGATION OF THE MASS TRANSFER PROPRETIES OF SALINE WATER SYSTEMS, Philoo Corp., Newport Beach, Calif.

J. L. Richardson, R. J. Getz, and G. Segovia.
Available from the National Technical Information Service as PB-210 539, \$11.00 in paper copy, \$0.95 in microfliche. Office of Saline Water Research and Development Progress Report No 211, September 1966. 163 p, 21 tab, 33 fig. 14-01-0001-440.

Descriptors: *Aqueous solutions, *Diffusion, *Electrolytes, Sea water, Thermal conductivity, Theoretical analysis, Viscosity, *Desalination, *Saline water, *Mass transfer.

Identifiers: Concentration polarization, Multicomponent salt solutions, Sea water properties, Solution properties, Sort effect.

tion properties, Soret effect.

The mass transfer properties of various saline solutions, including sea water, have been measured. Sufficient data were obtained for aqueous solutions of the predominant salt constituents of sea water so that the dependence of these diffusion properties on concentration and temperature can now be estimated with some confidence. The principal conclusions obtained from this investigation are that: (a) the Stefan-Maxwell relations provide a more accurate and convenient means for predicting molecular mass transfer in multicomponent solutions than the Nernst-type relations; (b) both the binary ordinary diffusion and Soret coefficients for the systems studied are relatively insensitive to concentration, but are marked functions of temperature — the Soret coefficient is even more sensitive to temperature than the ordinary diffusion coefficients; (c) the multicomponent ionic ordinary diffusion coefficients can be predicted with reasonable accuracy by using the Nernst-type species velocity-driving force equations; and (d) the viscosity and thermal conductivity of sea water can be estimated with reasonable accuracy by considering only the Na+, Mg++, Cl-ions. (OSW abstract)

DIFFUSION OF ELECTROLYTES: PRINCIPLES AND PRACTICE OF THE DIAPHRAGM DIFFUSION TECHNIQUE, Rensselaer Polytechnic Inst., Troy, N.Y. G. J. Janz, and G. E. Mayor. Available from the National Technical Information Service as PB-210 537, \$4.50 in paper copy, \$0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 196, September 1966. 46 p, 3 tab, 10 fig. 14-01-0001-422.

Descriptors: *Diffusion, *Electrolytes, Research equipment, Aqueous solutions, Experimental techniques, *Desalination, Diffusion.

Identifiers: *Diaphragm cell technique.

The principles and practice of the diaphragm cell technique for the measurement of diffusion of electrolytes are described. Discussion of theoretical principles is limited to points of practical interest in the reduction to practice of this experimental approach. The diaphragm cell, the ancillary apparatus and the techniques of calibration and measurement are examined in considerable detail from the viewpoint of the practicing experimentalist. Recent applications and results for severallelectrolytes are briefly considered. (OSW abstract) stract) W73-01692

MECHANISM OF BOULE FLOTATION ON WATER AND OTHER LIQUIDS, Rochester Institute of Tech., N.Y. Kenneth Hickman.
Available from the National Technical Information Service as PB-210 538, \$5.50 in paper copy, \$0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 200, September 1966. 64 p. 35 fig. 14-01-0001-375.

Descriptors: *Air-water interface, *Condensation, Mass transfer, *Evaporation, Flotation, Distilla-tion, Films, Surfaces, *Desalination, Liquids. Identifiers: Surface purification, *Boule flotation, Transfer coefficients.

The report discusses the reality and nature of the surface 'skins' that seem to form on relatively stagnant water. Floating drops and large multiple drops, named boules, that can be supported by the surface of slightly heated water were used as tools for the study of the water surface. Comparison studies were made with liquids other than water in order to distinguish phenomena associated broadly with the liquid-vapor interface. Another tool, the liquid jet tensimeter, was developed for the determand ton of the evaporation coefficient of water and other liquids as it functions with momentary exposure of clean surfaces. (OSW abstract) W73-01693

TRANSPORT OF ELECTROLYTES THROUGH MEMBRANE SYSTEMS,
Southern Research Inst., Birmingham, Ala.
M. S. Mintz.
Available from the National Technical Information Service as PB-210 536, \$5.25 in paper copy, \$0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 182, May 1966. 58 p, 8 tab, 16 fig. 14-01-0001-464.

Descriptors: *Electrodialysis, *Ion transport, *Permselective membranes, Transport depletion, Dialysis, Electro-osmosis, *Membrane processes, Osmosis, *Electrolytes. Identifiers: Irreversible thermodynamics, Mem-brane transport, Membrane properties, Transport

number.

Research on the transport of electrolytes through near-neutral cellophane and parchment membranes and through highly selective membranes was undertaken to obtain data on the characteristics of these membranes under the dynamic conditions of actual use and to develop heoretical expressions that would describe the performance of all electrically driven membrane processes. Data from electrical transport experiments and from dialysis experiments conducted under similar hydrodynamic conditions permitted the calculation of transference numbers for both ions and water that are characteristic of each membrane and the associated boundary layer in a given system. The data were also used to develop flux equations that combine the effects of electrical, dialytic, and osmotic transport through membranes and to calculate the phenomenological admittance coefficients that appear in the flux equations derived from irreversible thermodynamics. (OSW abstract)

RESEARCH ON MINERAL BY-PRODUCTS FROM SALINE WATER, Grace (W.R.) and Co., Clarksville, Md. M. L. Salutsky.
Available from the National Technical Information Service as PB-210 533, \$8.00 in paper copy, \$0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 137, July 1965. 105 p, 39 tab, 16 fig. OSW R and D Progress Report No 137, 14-01-0001-369.

Descriptors: "By-products, "Desalination, "Potassium compounds, Brine disposal, Brines, Calcium sulfate, Chemical precipitation, Cost analysis, Costs, Magnesium compounds, Phosphates, Sea water, Sodium compounds, Waste water treatment. Identifiers: Mineral recovery.

Several methods were investigated for recovering potassium from seawater and seawater brines. One method involved precipitation of potassium sulfate from concentrated brines with gypsum to form an insoluble complex sulfate. A preliminary cost estimate showed for a 50 million gallon/day water conversion plant, that this process for recovery of potash from the full flow of effluent should yield a potash by-product credit of approximately 6 cents/1000 gallons of fresh water produced. In other phases of the work it was found that potassium could be recovered from seawater brines by: digestion with preformed solid magnesium ammonium phosphate, by precipitation as potassium ferric phosphate, or by precipitation of preformed magnesia alba, a basic magnesium carbonate. (OSW abstract)

DESALINATION BY EELECTROSORPTION

AND DESORPTION, Southern Research Inst., Birmingham, Ala.

Nouthern Research Hist., Buildinguam, 1922.

Available from the National Technical Information Service as PB-210 532, \$7.75 in paper copy, \$9.95 in microfiche. Office of Saline Water Research and Development Progress Report No. 135, July 1965. 110 p, 10 tab, 25 fig. 14-01-0001-409.

Descriptors: *Desalination apparatus, *Desalina-tion processes, *Electrodialysis, Brackish water, Calcium sulfate, Cost analysis, Cost comparisons, Desalinatioe, Permselective membranes, Scaling, Water treatment. Identifiers: *Desorption

Identifiers: *Desorption.

Studies were carried out on an electrically driven membrane desalting process, termed the electrosorption process. This process depends on special ion-exchange membranes, which are comprised of an inner layer that is permeable to ions and solution, between an anion-permeable layer at one surface, and a cation-permeable layer at the opposite surface. The experiments indicated that when the water being treated contains calcium sulfate, precipitates formed within electrosorption membranes, but the precipitates did not appreciably increase the resistance of the membrane. Moreover, the precipitates were readily removed during desorption by the reversal of current normally used. The costs of demineralization by electrosorption were estimated by the standard Office of Saline Water procedure and were compared to the cost of demineralization by electrodialysis as estimated on the same basis. A 17% reduction in cost, mainly due to decreased amortization, was indicated if electrosorption was used. (OSW Abstract) stract) W73-01696

LAMINAR DISPERSION IN CAPILLARIES AND COUNTERFLOW TRANSPORT, Syracuse Univ. Research Inst., N.Y. R. J. Nunge, V. Ananthakrishnan, N. S. Reejhsinghani, Allen J. Barduhn, and William N.

Available from the National Technical Informa-tion Service as PB-210 531, \$8.50 in paper copy, \$0.95 in microfiche. Office of Saline Water Research and Development Progress Report No. 129, September 1965. 120 p, 69 fig, 4 tab, 32 ref. 14-01-0001-261.

Descriptors: "Desalination, "Freezing, "Mathematical model, "Laminar flow, "Porous media, "Reynolds number.
Identifiers: Ice washer, Particle beds, Capillary model, Peclet no., Taylor-Aris solution, Counterflow-washer, Porous beds.

The main problem of concern involved the washing of brine from the interstitial regions of a particle ice bed by invading the pore structure with fresh water. The solution to this problem was believed to reside in two general flow conditions. The first involved a batch process in which the solution saturated bed was invaded with solvent. In this case, the composition of the fluid leaving the bed was believed to comprise the desired unknown. The second solution involved use of a continuous process in which the ice particles, emerged vertically as a moving fixed bed from the entrapped brine solution. The main research goals were to obtain (1) the unequivocal description of transient laminar dispersion in a capillary tube, (2) a good explanation of transient dispersion in porous media, and (3) to describe mathematically the steady state laminar counter flow dispersion process. (OSW Abstract)

POLYMER STRUCTURE AND IONIC TRANS-PORT OF POLYSTYRENESULFONATE MODEL MEMBRANES, California Univ., Los Angeles.

California Univ., Los Angeles.
R. A. Wallace.
Available from the National Technical Information Service as PB-210 547, \$4.75 in paper copy, \$9.95 in microfiche. Office of Saline Water Research and Development Progress Report No. 240, February 1967. 48 p, 12 fig. 14-01-0001-439.

Descriptors: "Membranes, "Ion transport, "Ions, Model studies, Polymers, "Desalination. Identifiers: "Polymer structure, Water content, Polystyrene sulfonate membranes, Membrane conductivity, Ion permeable membranes, Ionic conduction, Water absorption.

conduction, Water absorption.

Ion transport inside existing ion-permeable membranes is treated theoretically in terms of various experimental variables: time, applied voltage, temperature and water content. The particular membrane consisting of polystyrenesulfonic acid in a polymeric matrix. Under the influence of an applied electric field, mobile ions migrate from one fixed sulfonic acid site to the next chiefly along the ionic polymer chains. To this molecular process of ion transport, Byring's rate theory for activated processes is applied to obtain quasi-theoretical relationships between ionic conductivity and the variables of temperature and membrane water absorption. Experimental apparatus was specifically designed to measure dc conductivity under precisely controlled conditions of relative humidity and temperature. Results indicate that the same type of ionic conduction occurs in both wet and essentially dry membranes. Ion-diffusion coefficients and entropy values for the unidirectional transport within the membrane are also presented. (OSW Abstract) Abstract) W73-01698

RESEARCH AND DEVELOPMENT OF NEW POLYMER SYSTEMS FOR REVERSE OSMOSIS MEMBRANES, Aerojet-General Corp., El Monte, Calif. C. W. Saltonstall, Jr., W. S. Higley, and W. M.

Available from the National Technical Informa-tion Service as PB-210 543, \$4.50 in paper copy, 50.95 in microfiche. Office of Saline Water Research and Development Progress Report No. 220, November 1966. 46 p, 11 tab, 3 fig. 14-01-001-435.

Descriptors: *Reverse osmosis, *Membranes, *Permselective membranes, Saline water, *Desalination, Semipermeable membranes, Pressure, Films, Permsebility, *Plastics, *Polymers, Identifiers: Poly (Vinylene glycol) membranes, Poly (Vinylene glycol) membranes, Poly (Vinylene glycol) membranes, Poly (Vinylene glycol) membranes, Polyacrylonitrile membranes, Water flux, Salt permeability, Dried polymer film.

rotyacrytonitrile membranes, Water flux, Salt permeability, Dried polymer film.

The objective is the development of new polymers that will yield reverse-osmosis membranes superior to cellulose acetate membranes in osmotic and mechanical properties, and in chemical stability. Poly (vinylene carbonate) has exhibited a salt-rejection potential comparable to that of cellulose acetate and a water permeability approximately 2.5 times that of cellulose acetate. Polyacrylonitrile and its hydrolyzed derivatives, on the other hand, did not exhibit higher than 31% salt recetion. Membranes of polyarylonitrile did show high product-water fluxes and it may be possible to take advantage of its good chemical stability in applications for removal of organic materials and other pollutants from water, including bacteria and viruses. A fully dried film of poly (vinylene carbonate), 3.75 mils thick, exhibited a salt retention of 94.0% and a product-water flux of 0.056 gfd when tested at 1500 psi with a 3.5% sodium chloride solution. Poly (vinylene glycol) membranes prepared by complete hydrolysis from poly (vinylene carbonate) membranes gid). Evaluation of fully dried films of polyacrylonitrile prepared from 14-to 20-mil wet-castings (16.5%) polymer in dimethylformamide solutions, showed that these films were brittle and porous. When tested at 1500 psi with 3.5% sodium chloride colution, thory gave fluxes of 8.4 to 2.8 gfd with no salt rejection. In contrast, water-swollen membranes prepared from polyacrylonitrile gave salt retentions up to 31%. The porosity in the dried film could result from cystallite formation at the expense of polymer density in adjacent amorphous areas. (OSW Abstract) W73-01699 W73-01699

DESALINATION BY THE INVERSION IN THE ORDER OF MELTING BY APPLIED PRES.

SURE,
Kansas State Univ., Manhattan.
R. G. Akins, L. T. Fan, and L. E. Erickson.
Available from the National Technical Information Service as PB-210 557, \$4.00 in paper copy,
\$0.95 in microfiche. Office of Saline Water Research and Development Progress Report No. 318, January 1968. 35 p, 15 fig, 1 tab. 14-01-0001-

Descriptors: *Desalination, *Freezing, *Ice, *Mass transfer, *Heat transfer, Pressure, Sea

The purpose was to investigate the proposed process as to its operation and feasibility for producing fresh water from sea water. A properly selected auxiliary system consisting of partially frozen organic is mixed with pre-cooled sea water. Because of the temperature differences the organic slurry melts and the sea water is partially frozen, thus producing fresh water ice and concentrated brine. The ice is separated from the brine, washed, and then is contacted again with the organic liquid. This mixture is pressurized, which melts the water and partially freezes the organic. The water and organic slurry are separated and then depressurized, producing fresh water and organic slurry. The advantages of this process are that it involves only condensed systems and the

heat transfer is accomplished in a gently mixed condition. The ice crystals formed in the liquid-liquid contact were anticipated to be of better size and quality than those produced under similar vapor-liquid contact conditions. The experimental work proceeded in three separate phases. First, in order to select an auxiliary system the phase diagram of several binary organic materials were determined at atmospheric pressure and at approximately 100 atmospheres pressure. With this information an organic mixture could be selected with the proper melting point range at the two pressures necessary. The second phase was a study of the heat and mass transfer when an organic altury was mixed with pre-cooled sea water. This was done in small tank contactor fitted with a stirrer in which the slurry and sea water could be mixed thus producing ice, concentrated brine, and melted organic. These were separated, the heat transfer determined, the ice crystals photographed, and the salinity of the fresh water determined. The heat transfer information led into the third phase of the work. This was the proper selection of equipment for larger sized plants, as well as the design of a continuously operating one thousand gallon per day plot plant. Work has also continued on the conceptual design for a one million gallon per day plant, although no final specifications are available yet. (OSW Abstract)

STUDIES ON THE HYDRATE PROCESS, ICE CRYSTAL GROWTH RATES, AND HYDRATE REACTION KINETICS, Syracuse Univ. Research Inst., N.Y. Remigio Fernandez, Jon B. Pangborn, and Stewart L. Colten.

L. Colten.

Available from the National Technical Information Service as PB-210 559, \$9.00 in paper copy,
\$0.95 in microfiche. Office of Saline Water
Research and Development Progress Report No.
333, April 1968. 134 p., 36 fig, 18 tab, 56 ref, append. 14-01-0001-617.

scriptors: *Desalination, *Freezing, *Ice, Hydrate processes. Identifiers: *Methyl chloride, *Methyl bromide, Hydrolysis, Sodium chloride solution, Dendrite

any arrows, so comme canonice sommon, Dendrite growth.

An experimental and theoretical study of ice growth rates in flowing sodium chloride solutions has been completed. A theoretical model, based on the boundary-layer energy and diffusion equations, has been formulated to predict ice growth rates in flowing NaCl solutions. Experiments with a continuous stirred tank reactor apparatus have provided both design data and valuable insights concerning the process of hydrate crystal formation. Because the design data are based on one particular hydrating agent, methyl bromide, the reactor operating conditions and the corresponding formation rates are not expected to apply without reservations to other agents or other reactors. However, by comparison with the data of others on propane and F-12 reaction rates, it appears that for water solidification rates under conditions of high agitation, the particular hydrating agent is not important. The methods employed in determining the effects of the various operating conditions are directly applicable to other systems and should be followed when systematic attempts are made to secure such data. Furthermore, the model of hydrate crystal growth which was explored should be useful for any liquid agent, and the factors which affect crystal formation should be the same regardless of agent, although they may differ in degree of importance. Hydrolysis rates of F-31 (CH2CIF), methyl bromide, and methyl chloride have been analyzed to see if they are excessive for use of the agent in the hydrate process. Methyl bromide hydrolyses much too rapidly to be considered for commercial use as a hydrating agent. F-31 and methyl chloride are acceptable for use in the hydrate process from the standpoint of acceptable loss by hydrolysis. (OSW Abstract)

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3A-Saline Water Conversion

AN IINVESTIGATION OF THE TRANSPORT PROPERTIES OF ION EXCHANGE MEMBRANES, Little (Aruthur D), Inc., Cambridge, Mass. J. H. B. George, R. A. Horne, and C. R. Schlaikjer. Available from the National Technical Informations Service as PB-210 538, 34-75 in paper copy, 90.95 in microfiche. Office of Saline Water Research and Development Progress Report No. 321, January 1968. 45 p, 6 tab, 12 fig. 14-01-0001-962.

Descriptors: *Electrodialysis, *Ion transport, *Membrane processes, *Permselective membranes, Aqueous solutions, Electrocsmosis, Electrocal conductance, Ions, Salt solutions, Desalination

Identifiers: Hydration number, Ionic mobility, Transport number, Transport processes, Water

Measurements have been made of the electrical conductivity of cation- and anion-permeable ion-exchange reain membranes in a number of ionic forms at 10, 25 and 40 degrees C and the corresponding Arrhenius activation energies calculated. Conductivity measurements have also been made on free solutions chemically analogous to the membrane systems and on membranes containing two mobile ions. The frequency-dependence of the membrane conductivity was also studied. Conductivities in the membrane are much lower than in free solution and the activation energies somewhat higher. In the case of mobile cations, but not anions, there is a very strong charge dependence. The observed conductivity phenomena are interpreted in terms of a general structural retardation of movement as a consequence of the enhanced water structure in the internal solution, and a more specific relaxation retardation arising from the interaction of the mobile ions with the total coulombic field in their environment. Water transport measurements indicate that the ions moving in a membrane carry with them their primary hydration sphere, a sizeable fraction of their total coulombic hydration atmosphere, and, especially in the case of larger species, entrained (or electroosmotic) water as well. (OSW Abstract)

ANNUAL REPORT 1971-1972. ENVIRONMEN-TAL RESEARCH LABORATORY, UNIVERSITY OF ARIZONA; ARID LANDS RESEARCH CENTER, ABU DHABI.

CENTERS, ABU DHABI.
Arizona Univ., Tucson. Environmental Research
Lab., and Arid Land Research Center, Abu Dhabi
(Trucial Oman).
For primary bibliographic entry see Field 03C.
W73-01771

INVESTIGATION OF POSSIBLE TOXICITY OF WATER DESALINATED BY THE ELECTROIONITE METHOD, Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
For primary bibliographic entry see Field 05F.

HYGIENIC ASSESSMENT OF WAT DESALINATED BY EVAPORATION, Ministerstvo Zdravookhraneniya SSSR, Mosco For primary bibliographic entry see Field 05F. W73-01829 WATER

DISTILLATION METHODS AND APPARATUS.

U.S. Patent No 3,595,759, 5 p, 6 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 888, No 4, p 1283, July 27, 1971.

Descriptors: *Patents, *Distillation, *Desalina-tion, Saline water, Fresh water, *Evaporation, *Condensation, Vapor.

The liquid to be distilled is vaporized in a continuous manner by forced convection surface evaporation. The vapor is passed at a high velocity into a condenser where it contacts a liquid. The vapor and fluid loss velocity producing an increase in the static pressure and the temperature of the vapor stream rises. Due to the pronounced varying velocity profile of the vapor, the compression and condensation of the vapor into the liquid approach an isentropic process. (Sinha-OEIS)

MULTISTAGE FLASH EVAPORATOR HAVING REMOVABLE FLASHING DEVICE, Baldwin-Lima-Hamilton Corp., Philadelphia, Pa.

(assignee)
W. M. Deputy, Jr., C. M. Jennings, and G. Levite.
U.S. Patent No 3,995,758, 2 p., 3 fig, 3 ref; Official
Gazette of the United States Patent Office, Vol
888, No 4, p 1283, July 27, 1971.

Descriptors: *Patents, Equipment, *Evaporation, *Desalination, Saline water, Fresh water, *Flash evaporation, Water treatment, Water quality.

A multistage flash evaporator for desalisating water is disclosed in which the flashing device between adjacent stages is removable from the evaporator shell. The flashing device is located in an opening in a shell aligned with a stage divider which separates an upstream stage from a downstream stage. It is coupled to the shell and the stage divider. The opening in the shell through which the device is inserted serves the added function of being a manhole to facilitate entry into the stages and thereby facilitate maintenance and speed of assembly. (Siaha-OEIS)

MULTIPLE EFFECT MULTISECTION FLASH

EVAPORATOR, Hitachi, Ltd., Tokyo (Japan). (assignee)

U.S. Patent No 3,595,757, 6 p, 5 fig, 2 ref; Official Gazetie of the United States Patent Office, Vol 888, No 4, p 1283, July 27, 1971.

Descriptors: *Patents, Brine, *Desalination, Fresh water, *Evaporation, *Flash evaporation, *Ther-mal power plants, Water quality, Water quality control, Water treatment, Sea water, Saline water.

Various effect sections are arranged in order of temperature from highest to lowest. Each section is divided into a number of flash chambers. The majority of the flash chambers constitute a heat recovery section, the minority constitute a heat dissipation section. Each effect section is provided with one brine heater for increasing the flash range of the chamber and thereby increasing the amount of vapor produced. One object is to facilitate the control of operation of the flash evaporator combined with a thermal or atomic power station. The quantity of fresh water produced can be adjusted in conformity with fluctuation in the load of the power station. (Sinha-OEIS)

WATER-DEMINERALIZING APPARATUS
WITH A CENTRAL REGENERANT COLLECTING AND DISTRIBUTING DEVICE,
Permutit Co. Ltd., London (England). (assignee).
F. Blight.
U. S. Patent No. 3,595,394, 3 p, 1 fig, 3 ref; Official Cazette of the United States Patent Office,
Vol 888, No 4, p 1204, July 27, 1971.

Descriptors: *Patents, *Demineralization, Resins, *Anion exchange, *Cation exchange, *Ton exchan

The regeneration of a bed of mixed cation-exchange and anion-exchange resins is accom-plished by forming the bed into layers with the

anion layer above the cation layer. The regenerant is passed downward through each layer. There is a central device for collecting and distributing regenerant. It consists of an inlet on the upper side for collecting the effluent of the anion layer at points above the interface between the layers. There is an outlet on the underside for introducing the regenerant of the cation layer at points below the interface. Nonreturn valves control the inlets and outlets. (Sinha-OEIS)

REVERSE OSMOTIC WATER PURIFICATION, American Cyanamid Co., Stamford, Conn. (as-

agace). L. S. Merriwether. U. S. Patent No. 3,593,852, 5 p, 1 fig, 1 tab, 4 ref; Official Gazette of the United States Patent Of-fice, Vol 828, No 3, p 833, July 20, 1971.

Descriptors: "Patents, Water purification, Saline water, Brackish water, Electrolytes, "Membranes, "Reverse osmosis, "Permselective membranes, "Dialysis, Water treatment.

Brackish or saline waters are purified by forcing the water under pressure through a permselective membrane. The dialysis element for the separation of water from dissolved materials, including electrolytes comprises a mechanically strong reinforcing grid having the strength to stand superosmotic operating pressures in a dialysis chamber. An intermediate layer furnishes support for a permselective membrane of the order of 50 to 1000 A thickness. It is a lipoprotein membrane derived from a living cell. (Sinha-OEIS)

MULTIPLE RE-USE OF WATER, El Paso Southern Co., Tex. (assignee). For primary bibliographic entry see Field 05D. W73-01846

3B. Water Yield Improvement

GROUNDWATER RESOURCES OF SIBERIA AND SOVIET FAR EAST (RESURSY PODZEM-NYKH VOD SIBERI I DAL'NEGO VOSTOKA), Akademiya Nauk SSSR, Irkutak. Institut Zemnoi

Kory. For primary bibliographic entry see Field 04B. For primar W73-01327

SMALL-SCALE ATMOSPHERIC MODIFICA-

TION.
Army Materiel Concepts Agency, Alexandria, Va.

Available from NTIS, Springfield, Va 22151 as AD-738 534; \$3.00 paper copy; \$0.95 cents microfiche. Report AMCA 72-004, January 1972.

Descriptors: "Weather modification, "Cloud seeding, "Cloud physics, Reviews, Forecasting, Conferences, Atmospheric physics, Precipitation (Atmospheric), Fog, Meteorology, Artificial

precipitation. Identifiers: Fog dissipation, Ad hoc working

An ad hoc working group discuss present capabili-An ad hoc working group discuss present capabilities and current operational and research programs in small-scale atmospheric modification. Relative complexity of fog, individual cumulus, orographic precipitation, and severe storms are considered. The discussions led to a group consensus of the anticipated state of small-scale modification capabilities 10-20 years in the future. (Woodard-USGS) W77.0.133. NATIONAL HAIL RESEARCH EXPERIMENT (FINAL ENVIRONMENTAL IMPACT STATE-IRNT). ational Science Foundation, Washington, D.C.

Available from the National Technical Informa-tion Service as PB-207 539-F, \$3.00 in paper copy, \$0.95 in microfiche. March 15, 1972. 21 p, 1 fig, 1

Descriptors: "Environmental effects, "Hail, "Silver iodide, "Weather modification, "Cloud seeding, Nucleation, Precipitation (Atmospheric), Ice, Freezing, Storms, Chemistry of precipitation, Clouds, Condensation, Weather, Cloud physics, Damages, Aquatic life, Terrestrial habitats. Identifiers: "Environmental Impact Statements, "Pawaee National Grasslands (Colo).

Pawaee National Grasslands (Colo).

This project involves a five year experiment to develop and test techniques for modifying halistorms in order to suppress the formation of hali size. Rockets launched from aircraft, aircraftborne wing fuses, and flares will deliver silver iodide nucleating materials into randomly selected developing hail cells over a test area of approximately 50 miles centered in northeastern Colorado. It is expected that hail production in a seeded cloud will be either reduced or terminated. The amount of rainfall received from the convective cell will probably not be affected; however, verification of this assumption is an objective of the experiment. No problem of silver contamination is expected, given the limited quantities of silver iodide to be employed, the small number of clouds to be seeded, and the wide dispersal of the nucleating material through precipitation. The silver will, in all probability, have no effect upon terrestrial organisms. Nevertheless, the possibility of a significant reaction of aquatic organisms to aliver cannot be discounted in the absence of information on silver dosages required to produce significant ecological damage. Comments from interested agencies are included. (Ellis-Florida)

EVALUATION OF POTENTIAL BENEFITS OF

EVALUATION OF POTENTIAL BENEFITS OF WEATHER MODIFICATION ON AGRICULTURE, PART 1, Illinois State Water Survey, Urbana. S. A. Changaon, Jr., and F. A. Huff. Available from the National Technical Information Service as PB-206 249, \$3.00 in paper copy, \$0.95 in microfiche. Department of Interior, Bureau of Reclamation, Office of Atmospheric Water Resources, October 51, 1971. 77 p, 16 fig, 25 tab, 14 ref. 14-06-D-6843.

Descriptors: *Weather modification, *Cloud seed-ing, *Crop response, *Crop production, Rainfall, Benefits, Agriculture, Soybeans, Cost-benefit analysis. Identifiers: *Corn crops.

Identifiers: *Corn crops.

Multiple regression analysis is used to investigate the probable effects of rainfall modification on the yields and economic benefits of Illiands' two major crops, corn and soybeans. Crop yield and weather data for the years 1931-1968 were used to estimate the impact of technology trends, temperature changes, and precipitation levels on crop yields in 13 Illiands regions. Hypothetical cloud seeding models were then combined with the appropriate regional equation to evaluate the effects of seeding-induced changes in July-August rainfall on crop yield. Results suggested that in most regions, corn and soybean crops would be benefited economically in the majority of the growing seasons through a cloud seeding program, provided that the seeding operator had the capability to produce rainfall increases of 10 percent or more. The impact of seeding on crop yield was found to vary substantially between regions because of differences in soil properties and climatic variations. Furthermore, seeding effectiveness may vary considerably from year-to-year due

to the temporal variability in daily rainfall distribu-tion characteristics. This temporal variability ex-plains some of the conflicting results obtained in past seeding experiments. (Settle-Wisconsin) W73-01593

3C. Use of Water of Impaired Quality

SECONDARY SALINIZATION OF IRRIGATED LAND IN THE VOLGA-DON INTERFLUVE (Y-TORICHNOVE ZASOLENIYE OROSHAYE-MYKH ZEMEL' VOLGO-DONSKOGO MEZH-DURECH'YA), N. Ye. Varlamov.

Pochvovedeniye, No 2, p 112-122, February 1972. 1 fig, 6 tab, 5 ref.

Descriptors: "Land reclamation, "Irrigated land, "laterfluves, "Salinity, "Saline soils, Chestnut soils, Soil groups, Soil types, Soil horizons, Irrigation, Irrigation canals, Drainage, Leaching, Inorganic compounds, Water chemistry, Water analysis, Water properties, Groundwater, Water table. Identifiers: "USSR, "Volgograd Oblast, "Volga River, "Don River, "Mineralization, Solonetzes, Solonchaks.

Solonchaks.

Irrigation of nonsaline, strongly saline, and strongly solonchak Chestnut soils of the Var-varovskays irrigation system raised the groundwater level to 1-3 m from the land surface in the Volgograd Oblast in 1955-70. Readily soluble salts originally contained in the soil increased groundwater mineralization from 1-3 to 8-14 glitter. Secondary soil salinization began at a groundwater depth of about 4 m, with the soil becoming solonchakic at a groundwater depth of 3 m or less. Average rate of salt accumulation between 1960 and 1970 was 2.5 metric tons of solid residue per hectare and 0.4 metric ton of chlorides per hectare. In the first stages of salinization, adsorbed calcium was displaced by sodium derived from lower horizons and groundwater, which led to secondary soil salinization. Total alkalinity was low throughout the profile at all stages of secondary salinization but increased sharply after leaching. Secondarily salinized soils can be effectively reclaimed by leaching combined with drainage and by application of gypsum. (Josefson-USGS)

THE INFLUENCE OF PHOSPHORUS AND NITROGEN ON MILLET AND CLOVER GROWING IN SOILS AFFECTED BY SALINITY, I. PLANT DEVELOPMENT, Hebrew Univ., Rehovot (Israel). Dept. of Soil

Science. S. Ravikovitch, and D. Yoles. Plant and Soil, Vol 35, No 3, p 555-567, 1971. 4 tab, 4 fig, 1 photo, 10 ref.

Descriptors: "Saline soils, "Plant growth regula-tors, "Plant growth, "Salt tolerance, "Salinity, "Saline water, "Soil treatment, "Soil amendments, Inhibitors, Plant physiology, Soil-water-plant rela-tionships, Phytotoxicity, Plant growth substances, "Soil contamination effect, Pertilization, Nitrates,

The utilization of saline soils raises the problem of providing growing conditions which will support reasonable plant productivity. This study examines the growth of foxtail millet and clover in soils of varying degrees of salinity treated with nitrogen and phosphorus. Salinity levels were achieved by addition of sodium chloride. Nitrogen and phosphorus were added to NH4NO3 and H3PO4. The growth of millet decreased sharply with increase in soil salinity when N-P treatments were not applied. However, the development of the plant changed under saline conditions when nitrogen and phosphorus were added. Various N-P

combinations affected plant growth in saline soil differently. Phosphorus when applied at relatively high rates, significantly improved plant growth. Increased rates of N in the N-P treatments generally had no significant effect, and growth was reduced when the N/P ratio was highest. Clover ceased to grow when the salinity of the soil exceeded 7 mm-hos/cm and no N-P was added. Phosphorus enhanced the growth of clover, which even graw at the highest salinity level tested (13 mmhos/cm), at high rates of its application in the N-P combinations. Nitrogen had no marked effect on clover development. (See also W73-01764) (Black-Arizona) developme: Arizona) W73-01763

THE INFLUENCE OF PHOSPHORUS AND NITROGEN ON MILLET AND CLOVER GROWING IN SOILS AFFECTED BY SALINITY. II. PLANT COMPOSITION, Hebrew Univ., Rehovot (Israel). Dept. of Soil

nt and Soil, Vol 35, No 3, p 569-588, 1971, 15

Descriptors: "Plant growth regulators, "Plant physiology, "Absorption, "Crop response, "Soil amendments, "Biochemistry, "Metabolism, "Translocation, Saline soils, Inhibitors, Phytotoxicity, Plant growth, Nutrient requirements, Physiological ecology, Salt tolerance, Salinity, Additives, Soil-water-plant relationships, Fertilizers

The study of the effect of N-P applications on growth of millet and clover in soils of various salinity levels (Part I) led to work on the extent to which such treatments influence chloride and sodium absorption by these plants, as well as their phosphorus, potassium and nitrogen contents, and the properties related to the cell sap of millet. Plants grown on soil having a high salinity content were compared to control plants grown on non-saline soil. Millet displayed an increase inchoride, sodium, nitrogen, phosphorus and potassium content. In clover, there was an increase in chloride, sodium and phosphorus levels and a decrease in potassium. Increasing the phosphorus level in the N-P treatments applied to the soil at constant nitrogen, resulted in an increase in the phosphorus and a decrease in the chloride and sodium contents of both millet and clover. When the N level in the N-P treatments increased, sodium and chloride contents in millet increased, sodium and chloride contents in millet increased and the potassium contents decreased. The chloride content in clover increased and there were no significant changes in sodium and potassium contents in this plant. The application of N-P to the soils generally reduced the electric conductivity and the oamotic pressure of the cell sap. (See also W73-01763) (Black-Arizona)

QUALITY OF IRRIGATION WATERS AND THEIR EFFECT ON SOIL PROPERTIES IN RAJASTHAN—A REVIEW, Udaipur Univ. (India). Agricultural Experiment Station.

K. V. Paliwal. Annals of Arid Zone, Vol 10, No 4, p 267-278, December 1971. 3 tab. 57 ref.

Descriptors: "Irrigation, "Salinity, "Saline water,
"Saline soils, Irrigation effects, "Irrigation water,
Agriculture, Arid lands, Irrigation wells, Irrigation practices, Soil-water-plant relationships, Analytical techniques, Laboratory tests, Irrigation canals,
Water quality, Soil analysis.
Identifiers: "Rajasthan (India).

Under arid and semi-arid conditions, irrigation is essential for successful agriculture. However, large areas are going out of cultivation each year due to irrigation with saline water. In Rajasthan,

Field 03-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3C-Use of Water of Impaired Quality

India, resources for irrigation water are very meager where only 6 per cent of the total area of 34,222 hectares is under irrigation. Fifty-eight per cent of this small amount is covered by well waters; the balance by tanks and canals. Quality of irrigation water resources of Rajasthan and their effect on soil properties are reviewed. Conclusions indicate that canal waters are quite suitable for irrigation purposes. Well waters of western Rajasthan are more saline and hazardous than those in the east. Saline water-irrigated soils have moderate to high levels of salinity and alkalimity depending on the quality of well water used. As reflected in the statistical analysis, lack of equilibrium between the irrigation water and the soil solution is responsible for the low degrees of predictability. Better relationships are observed through systematic study of equilibrium conditions in the laboratory. (Black-Arizona)

ANNUAL REPORT 1971-1972, ENVIRONMEN-TAL RESEARCH LABORATORY, UNIVERSITY
OF ARIZONA; ARID LANDS RESEARCH
CENTER, ABU DHABI.
Arizona Univ., Tucson. Environmental Research
Lab., and Arid Land Research Center, Abu Dhabi

(Trucial Oman)

1971, 42 P. 12 PHOTOS, 1 FIG.

Descriptors: "Greenhouses, "Environmental effects, "Desalination, "Microenvironment, "Irrigation design, "Crop production, "Crop response, "Horticulture, "Plant physiology, "Irrigation systems, "Plant breeding, "Experimental farms, "Laboratories, "Desalination plants, "Environmental control, Water conservation, Social impact, Ecomonic impact, Horticultural cones Ispact, Economic impact, Horticultural crops, Irrigation effects, Evaporation control, Transpiration control, Pilot plants, Structures. Identifiers: *Abu Dhabi.

Studies at the Environmental Research Laborato-Studies at the Environmental Research Ladorato-ry in Tucson, Arizona, were originally aimed at devising a technique to reduce the cost of desalina-tion, and a pilot plant was constructed on the Gulf of California at Puerto Penasco, Sonora. It was realized that an energy source more manageable than sunshine was going to waste; i.e. the heat from two diesel engines used to pump water, power mechanical equipment, and light the sta-tion. Solar collectors were therefore abandoned, and heat exchangers were attached to the exhausts and heat exchangers were attached to the exhausts and water jackets of the engines. These now provide the heat for a unit which makes 2400 gallons of fresh water a day. It also became apparent that desalted water would remain too expensive for conventional open-field agriculture. Consequently, various methods for growing crops with a minimum expenditure of water were examined. num expenditure of water were ex Plastic-covered greenhouse structures are being used, and various vegetable crops are grown directly in beach sand. Necessary nutrients are mixed with the desalted irrigation water, and only the root zone is irrigated. As a result of this research, the University of Arizona received a research, the University of Arizona received a grant in 1964 from the ruler of the small Arabian peninsula of Abu Dhabi to establish a power/water/food facility in that country. In February 1972, a five-acre plant began full production of another factors and personal personal production of another factors. February 1972, a two-acre piant began tull produc-tion. Progress on construction of another 5-acre facility on the Fort Yuma Indian Reservation near Yuma, Arizona, and a 'teaching greenhouse' at Sells High School on the Papago Indian Reserva-tion; progress at Environmental Farms, Inc., a commercial grower in Tucson; and horticultural research, plant physiology, instrumentation and phytocell design, and materials engineering are discussed. (Black-Arizona)

3D. Conservation in Domestic and **Municipal Use**

A METHODOLOGY FOR SELECTING AMONG WATER QUALITY ALTERNATIVES, Florida Univ., Gainesville. For primary bibliographic entry see Field 05D. W73-01352

EMERGENCY DELIVERY OF COLORADO RIVER WATER TO TIJUANA, BAJA CALIFOR-NIA, MEXICO VIA FACILITIES IN CALIFOR-NIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
International Boundary and Water Commission,

For primary bibliographic entry see Field 06E. W73-01391 El Paso, Tex.

AN EVALUATION OF ENERGY GROWTH AND AN EVALUATION OF ENERGY GROWTH AND
USE TERNDS AS A POTENTIAL UPPER LIMIT
IN METROPOLITAN DEVELOPMENT,
Battelle Memorial Inst., Richland, Wash. Pacific
Northwest Labs.
Forprimary bibliographic entry see Field 05C.
W73-01576

WATER RESOURCES PLANNING TO SATISFY WALER RESOURCES PLANNING TO SATISFY GROWING DEMAND IN AN URBANIZING AGRICULTURAL REGION, Utah State Univ., Logan. Coll. of Engineering. For primary bibliographic entry see Field 06D. W73-01776

WATER SUPPLY AND SEWERAGE. World Bank, Washington, D.C. For primary bibliographic entry see Field 06D. W73-01802

3E. Conservation in Industry

AN EXAMINATION OF APPLICATIONS OF AN EXAMINATION OF APPLICATIONS OF REMOTE SENSING DATA TO METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS' PLANNING REQUIREMENTS, Metropolitan Washington Council of Governments.

ments, D. C.
H. J. Mallon, J. Y. Howard, and K. M. Karch.
Available from NTIS, Springfield, Va 22151-as
PB-209 684; Price \$3.00 Paper copy; 95 cents
microfiche. Geological Survey Interagency Report
USGS-224, December 1971. 59 p, 29 fig, 1 tab, 16

Descriptors: "Remote sensing, "City planning, "Urbanization, "Urban hydrology, "Land development, Regional development, Aerial photography, Data collections, Water pollution sources, Transportation, Surveys, Reviews.

This study is one of the Metropolitan Washin This study is one of the Metropolitan Washington Council of Governments' series of investigations into remote sensing data for use in support of urban and regional planning. The programs, deal with subjects as diverse as water quality and sources of supply and traffic behavior. Examples of application, methods for data utilization and corresponding photographic illustrations are provided. (Woodard-USGS) W73-01299

A METHODOLOGY FOR SELECTING AMONG WATER QUALITY ALTERNATIVES, Florida Univ., Gainesville. For primary bibliographic entry see Field 05D.

THE WATER PROBLEM IN RELATION TO MINING AT KONKOLA DIVISION, NCHANGA CONSOLIDATED COPPER MINES LIMITED, Nchanga Consolidated Copper Mines Ltd., Kon-kola (Zambia). For primary bibliographic entry see Field 04B. W73-01727

WATER RESOURCES PLANNING TO SATISFY GROWING DEMAND IN AN URBANIZING AGRICULTURAL REGION, Utah State Univ., Logan. Coll. of Engineering. For primary bibliographic entry see Field 06D. W73-01776

SCIENCE, TECHNOLOGY, AND DEVELOP-MENT, VOLUME IV, INDUSTRIAL DEVELOP-

Available from the National Technical Informa-tion Service as PB-207 497, \$3.00 in paper copy, \$0.95 in microfiche. U.S. Papers prepared for the UN Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas, Geneva, Switzerland, 1962. 190 p.

Descriptors: "Industries, "Institutions, Industrial production, Management, Planning, Analysis. Identifiers: "Industrial development, "Economic development, "Products, Less developed coun-

Nineteen of the papers prepared for the 1963 Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas are presented. The papers are divided into four broad areas: (1) approaches to industrial development, (2) essential programs and key institutions, (3) industry analyses, and (4) product analyses. The first group of papers is concerned with the fundamental policies underlying industrial development and the strategies and methodologies for carrying out these policies. The papers on key programs and institutions focus on such topics as the capital formation process, management training, small and medium-sized industry, retail markets, river-basin projects and industrialization, applied-research and economic development, and computerization. The papers on industry analysis examine (1) the place of an iron and steel industry in a developing economy, (2) the technology for direct reduction of iron ore, (3) food processing, (4) the forest-products industry, and (5) the textile industry. The last group of papers is concerned with products holding promise for the less developed areas. The products analyzed include fertilizers, occomuts, and vegetable, marine, and animal fats. (See also W73-01805) (Settle-Wisconsin) W73-01804

INTEGRATED RIVER-BASIN DEVELOPMENT

INTEGRATED RIVER-BASIN DEVELOPMENT AND INDUSTRIALIZATION: THE TENNESSER VALLEY EXPERIENCE, Indiana Univ., Bloomington. International Business Studies. S. H. Robock. In: Science, Technology, and Development, Volume IV, Industrial Development, UN Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas, 1962, p 71-85. 4 tab, 10 ref.

Descriptors: *River basin development, *Tennes-see Valley Authority, Water resources develop-ment, Income, Employment, Institutions. Identifiers: *Industrialization, Economic develop-

The general relationship of integrated resource development and industrialization is investigated by examining the industrialization pattern of the Tennessee Valley. One basic characteristic of integrated river-basin projects is that they represent only a partial approach to the development of a re-

WATER SUPPLY AUGMENTATION AND CONSERVATION-Field 03

Conservation in Agriculture—Group 3F

gion. A comprehensive development effort to raise levels of production, employment, and income in an area must include many governmental and non-governmental programs. A second basic characteristic of river-basin projects is that their main influence is on the physical supply and cost conditions of certain resources in the region. Consequently, markets must already exist for the specific resources being improved. The key TVA programs influencing industrialization were (1) physical resources improvement, (2) technical studies and research, and (3) planning and industrial promotion. The industry groups attracted by TVA programs were chemicals, primary metals, forest products, electrical machinery, and food. In general, TVA'S approach to industrialization can be an example to the less developed countries. Possibly the greatest contribution of a river-basin project to economic development is through regional institutional building which helps mobilize all the human and institutional resources of a region. (See also W73-01804) (Settle-Wisconsin)

ON MODELS OF COMMERCIAL PISHING: A DEFENSE OF THE TRADITIONAL LITERATURE.

TURE,
Department of Commerce, Washington, D.C.
For primary bibliographic entry see Field 06A.
W73-01810

POLICY PRESCRIPTIONS IN BIONOMIC MODELS: THE CASE OF THE FISHERY, British Columbia Univ., Vancouver. For primary bibliographic entry see Field 06A. W73-01812

COMMERCIAL FISHERY INVESTIGATIONS, West Virginia Dept. of Natural Resources, Charleston. For primary bibliographic entry see Field 06C.

A LOCALIZED STUDY OF GRAY IRON FOUN-DRIES TO DETERMINE BUSINESS AND TECHNICAL COMMONALITIES CONDUCIVE TO REDUCING ABATEMENT COSTS. Commins (J. A.) and Associates, Inc., Fort Washington, Pa. For primary bibliographic entry see Field 05G. W73-01815

3F. Conservation in Agriculture

EVAPOTRANSPIRATION FROM SOYBEAN AND SORCHUM FIELDS, Kansas State Univ., Manhattan. Dept. of Agronomy. For primary bibliographic entry see Field 02D. W73-01346

THE EARLY STAGES OF GRAIN DEVELOP-MENT IN WHEAT: RESPONSE TO WATER STRESS IN A SINGLE VARIETY, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry. I.F. Wardlaw.

I. F. Wardiaw. Aust J Biol Sci. 24 (6): 1047-1055. Illus. 1971. Identifiers: Cell development, Endosperm, *Grain development, Photosynthesis, Triticum-aestivum-M, *Water stress, *Wheat-M, Yield.

In wheat (Triticum aestivum cv. 'Gabo') a temporary water deficit in the 1st 7 days following anthesis significantly reduced the final grain weight per car. A reduction in seed set in response to stress was associated with an initially greater rate of development of the remaining grains, with an enhanced rate of cell division in the endosperm.

Relative turgidity measurements indicated that the stress applied did not significantly reduce grain water content, although the ear structure showed some water loss, and the stem and flag leaf blade were quite severely stressed. The greater desiccation of the leaf and stem in comparison with the ear was reflected in the lower rate of photosynthesis of these organs under stress conditions. With the reduction in net photosynthesis, both during and subsequent to the period of water deficit, there was a marked reduction in the storage of dry material in the stems of stressed plants, a temporary cessation of tiller development, and an almost complete inhibition of net root growth in dry weight. However, estimates of net photosynthesis by the upper parts of the plant indicated that this was probably in excess of that required for grain growth in the stressed plants. Also, experiments in which additional grains were removed from the ears of stressed plants 10 days after anthesis gave no indication of a substrate limitation to grain growth. Thus the interaction between a temporary water deficit during the early stages of grain development and final grain yield would appear to be an indirect one.—Copyright 1972, Biological Abstracts, Inc.
W73-01361

STUDIES ON THE AUTO-IRRIGATION AT NIGHT IN THE PADDY RICE FIELDS, Central Research Inst. of Electric Power Industry, Tokyo (Japan).
Keiichi Nakayama, and Gunji Ouchi.
J Agric Lab (Chiba). 11. 7-18. Illus. 1971. In Japanese with English summary.
Identifiers: "Auto-irrigation, Irrigation, "Paddy rice fields, "Rice-M.

The experiments were conducted to clarify both the effects of the auto-irrigation at night in the paddy field and the advantages derived from the improved irrigation method. The auto-irrigation at night is a good method not only for the raising of the maximum and mean water-temperature near the inlet of irrigation water in paddy fields, but also for the promotion of the diurnal amplitude of water-temperature. The rise in water-temperature by the auto-irrigation at night is linearly related to the increase in the diurnal amplitude of air-temperature. The auto-irrigation at night promoted the rooting after transplanting and the tillering of rice plants. In addition, it increased the percentage of ripened grains. By means of the improved auto-irrigation at night, the rainwater became available more effectively as irrigation water paddy fields.—Copyright 1972, Biological Abstracts, Inc. W73-01369

TENSIOMETERS AND THEIR APPLICATION TO DETERMINATION OF THE MOISTURE CONTENT OF SOIL AND IRRIGATION DATES, (IN RUSSIAN),
For primary bibliographic entry see Field 02G. W73-01376

THE ROLE OF FERTILIZERS IN THE IM-PROVEMENT OF PRODUCTIVITY OF THE ERODED NON-IRRIGATED SOILS OF TADZ-HIKISTAN, (IN RUSSIAN), A. A. Sadriddinov. Tr Tadzh Nauchno-Isaled Inst Pochvoved 13 (2):

Tr Tadzh Nauchno-Issled Inst Pochvoved 13 (2): 217-230. 1970. Identifiers: *Crop production, *Fertilization, Erosion control, Erosion, Fertilizers, Grains, Nonirrigated soils, Soils, Tadzhikistan, USSR...

In field experiments on calcareous cinnamon soils and dark sierozems eroded to varying degrees, the application of 280 kg/ha Nan (NH4NO3) led to a yield increase of approx. 500 kg/ha. NP was the best experimental variant, augmenting the yield to 1200 kg/ha. The combined application of N and P increased the absolute weight of grain and its N content. The intensive development of roots under

the effect of manuring prevented erosion of the soils and improved their productivity.—Copyright 1972, Biological Abstracts, Inc. W73-0137

THE USE OF FERTILIZERS UNDER IRRIGA-TION IN ROMANIA, (IN RUSSIAN), I. Khulpoi, I. Piku, and K. Karamete. Tr Ves Nauchno-Lasked Inst Udobr Agropochvoved 47. p 77-111. 1970. Identifiers: "Fertilization, "Crop production, Sugar beets, Corn, Fertilizers, Irrigation, Nutrition, Romania, Soybeans, Sunflowers, Wheat.

Results obtained in studies of the interaction of irrigation and manuring, the efficacy of different kinds of fertilizers, applied to main crops (corn, sugar beet, soybean, sunflower, wheat, fodder crops), at different times, the effect of manuring and irrigation on the soil nitrates, P, and mobile K contents and on the chemical composition and quality of wheat and corn are presented.—Copynght 1972, Biological Abstracts, Inc.
W73-01386

EAST GREENACRES UNIT, PRAIRIE DIVI-SION, RATHDRUM PRAIRIE PROJECT, IDAHO (FINAL ENVIRONMENTAL IMPACT STATEMENT). Bureau of Reclamation. Boise, Idaho. Region 1. For primary bibliographic entry see Field 08B. W73-01396

LONG DRAW RESERVOIR ENLARGEMENT PROJECT, COLORADO-AN APPLICATION UNDER THE SMALL RECLAMATION PROJECTS ACT FOR WATER SUPPLY AND STORAGE COMPANY (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Bureau of Reclamation, Denver, Colo. Region 7. For primary bibliographic entry see Field 08D. W73-01402

DYNAMICS OF NITRATES IN IRRIGATED CALCAREOUS CHERNOZEM (IN RUSSIAN), For primary bibliographic entry see Field 05B. W73-01410

PREVENTION AND CONTROL OF EROSION OF IRRIGATED LAND BY WATER (PREDOT-WASHICHENIYE VODNOY EROZII I BORTBA S NEYU NA OROSHAYEMYKH ZEMLYAKH), For primary bibliographic entry see Field 04D. W73-01519

THE VALUE OF IRRIGATION WATER, Monash Univ., Clayton (Australia). For primary bibliographic entry see Field 06B. W73-01591

FIELD BEHAVIOR OF GEZIRA CLAY UNDER IRRIGATION, Cotton Research Corp., Wad Medani (Sudan). For primary bibliographic entry see Field 02G. W73-01640

PLANT INDICATORS OF ALLUVIAL SOILS OF CENTRAL IRAQ, Baghdad Univ. (Iraq). Coll. of Agriculture. For primary bibliographic entry see Field 02G. W73-01767

GERMINATION AND YIELD OF BARLEY WHEN GROWN IN A WATER-REPELLENT SAND, Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.

Field 03-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation in Agriculture

W73-01768

IWANOFF EFFECT IN LEAVES OF COTTON (GOSSYPIUM HIRSUTUM), Australian National Univ., Canberra. School of

Australian National Univ., Canberra. School of General Stüdies. E. G. Brittain, and S. Nagarajah. Physiol Plant. Vol 25, No 3, p 441-447. 1971. Illus. Identifiers: "lwanoff effect, "Cotton-D leaves, Diffusion, Gossypium-Hirsutum-D, "Hydroactive closure, Leaves, Oxides, Petiole, Photosynthesis, Porometer, Psychrometers, "Stomatal excision, Thermocouple, Transpiration.

When a leaf is excised from a plant by cutting the petiole in air, the stomata sometimes exhibit an 'Iwanoff effect' or temporary increase of aperture before entering the phase of hydroactive closure. Simultaneous and separate measurements of anaspiration from upper and lower leaf surfaces, derived from thermocouple psychrometers, photosynthesis measurements from either or both surfaces obtained with an IR gas analyzer and measurements with a nitrous oxide diffusion porometer were made on leaves of Gossypium hirsutum before and after severing the petiole. The effect of previous illumination of the plant on the occurrence of the Iwanoff effect was studied. The results obtained are consistent with the suggestion that an Iwanoff effect is observed when there is little or no water stress, but fails to appear if water stress has developed, even though it may not yet have reached the level at which hydroactive stomatal closure would occur. Furthermore, the Iwanoff effect appears to be limited to the stomata of the upper surface in cotton leaves. This seems to be due to the greater accessibility of the upper than the lower epidermal cells, and to the water demand of the internal tissues which follows excision. Evidence is also presented to show that the daxial stomates do not necessarily close completely in the dark.—Copyright 1972, Biological Abstracts, Inc.

W73-01859

THE RESPONSE OF REPLANT PRACE TREES TO WEEDICIDE, DAILY TRRIGATION, MITROGEN AND PHOSPHORUS, Department of Agriculture, Ferntree (Victoria). Scoresby Horticultural Research Station. P. D. Mitchell, and J. D. F. Black. Aust J Exp Agric Anim Husb. Vol 11, No 53, p 699-704, 1971. Illus. Identifiers: Irrigation, "Nitrogen, "Peach-D, "Phosphorus, Plants, Replant trees, "Weedicide, Weight, Tree growth.

Statistically significant responses were obtained on top weight, weight of new wood, and root weight in favor of weedicide, daily watering and high N. There was no response to P. Shoot thickening was the dominant factor in the response to irrigation, and shoot length the dominant factor in the response to N. Both factors played a part in the response to weedicide. Under daily watering the root spread was greater, the main roots more uniformly tapered, and the fiber root longer and less contorted than under longer interval watering.—Copyright 1972, Biological Abstracts, Inc. W73-01864

PERIODIC NOCTURNAL STOMATAL OPEN-ING OF CITRUS IN A STRADY ENVIRON-MENT, Agricultural Research Service Phoenix Aric Many 1, Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab. For primary bibliographic entry see Field 02L. W73-01865

THE INFLUENCE OF MOISTURE CONTENT ON THE DRY MATTER INTAKE AND DIGESTIBILITY OF SPINELESS CACTUS, I.L. Terblanche, A. M. Mulder, and J. W.

nimalia, Vol 3, No 2, p 73-78, 1971, Illus, En-Agroanimalia. Vol 3, No 2, p 73-78. 1971. Illus. English summary. Identifiers: "Cactus-D, Digestibility, Dry matter, Matter, "Moisture content, Spineless cactus, "Sheep (Merino wethers).

Matter, "Moisture content, Spineless cactus, "Sheep (Merino wethers).

Chopped spineless cactus cladodes (Opuntia sp. var. Chico) were fed to Merino wethers. Treatment consisted of cactus cladodes with the following average moisture contents: 89.8% (fresh); 72.4% (wilhed) and 12.1% (dried). Dry matter inake, free and total water intake, digestibility and body weight changes were determined. Drying of cactus resulted in a significant increase in dry matter intake. The average intakes of dry matter on the fresh, witled and dried cactus were 345.7; 396.1 and 507.1 g/sheep/day, respectively. Significant positive correlations were determined between dry matter intake and the dry matter content of the fresh and wilted cactus and between dry matter intake and total water consumption on all 3 treatments. Free water and total water intakes on fresh, wilted and dried cactus were, respectively, 27.8 ml and 2957.6 ml and 343.3 ml and 1481.6 ml and 167.9 ml and 2036.7 ml/sheep/day. The ratios of dry matter intake to total water consumption were 1:8 on fresh, 213 on wilted and 1:4 on dried cactus. The water requirements of sheep were apparently satisfied by fresh cactus. The lower dry matter intake by sheep on the fresh cactus, can be attributed mainly to a higher 'bulkiness' and possibly to an excess water intake as feed only in the case of fresh cactus. The total digestible nutrient of fresh, wilted and dried cactus as feed only in the case of fresh cactus. It is recommended that spineless acctus, 4.51 kg on wilted cactus and -0.23 kg on dried cactus. It is recommended that spineless acctus be utilized in a dried form during droughts.—Copyright 1972, Biological Abstracts, Inc. W73-01871

UREA IN THE DRINKING WATER AS A PROTEIN SUPPLEMENT FOR BEEF CATTLE ON LOW QUALITY ROUGHAGE, Volcani Inst. of Agricultural Research, Bet-Dagan

Volcani inst. of Agricultural Research, Bet-Dagan (Israel). Z. Holzer, and D. Levy. Isr J Agric Res. Vol 21, No 3, p 127-132, 1971. Identifiers: "Beef cattle, Flour, Molasses, "Protein supplement, Roughage, Straw, "Urea, Wheat-M, "Potable water.

Wheat-M, *Potable water.

Urea was supplied in the drinking water to IsraeliPriesian bull-calves receiving a basic ration of
ground wheat straw. In a digestion and N balance
trial in which additions of 300 g wheat flour and of
500 g molasses to the straw were tested, there
were no significant differences between treatments in intake of straw or in digestibility of crude
fiber. The N balance of the control treatment (no
urea or additive) was negative, while that of all the
treatments was positive; the differences were
highly significant. In a feeding trial, consisting of a
61-day period on a low energy diet followed by a
62-day period on a low energy diet followed by
6 gurea daily, and (b) the N equalized to that in
(a) by the addition of plant protein. The differences in daily weight gain were insignificant in the
first period but highly significant in the second
period. It is assumed that a supply of urea in the
drinking water can prevent weight losses in cattle
grazing on dry pastures but it cannot support
production.—Copyright 1972, Biological Abstracts,
inc.
W73-01872

EFFECTS OF INCREASING AMOUNTS OF OR-GANIC RESIDUES ON CONTINUOUS CORN: I. YIELDS AND SOIL PHYSICAL PROPERTIES, IOWA State Univ., Ames. Y. B. Morachan, W. C. Moldenhauer, and W. E.

Agron J. Vol 64, No 2, p 199-203. 1972. Illus.

Identifiers: Alfalfa-D, Avena-Sativa-M, Brome Bromus-Inermis-M, Calcium, *Corn-M, Brosion Grass-M, Infiltration, Magnesium, Medicago, Sativa-D, Oat-M, *Organic residues, Potassium Runoff, Sawdust, Soil, Straw, Crop yield, Zea Mays-M.

Runoff, Sawdust, Soil, Straw, Crop yield, Zea-Mays-M.

When well-fertilized corn (Zea mays L.) monocultures with large amounts of residues returned to the soil became common, the question was asked as to whether soil tith and corn yields could be maintained at satisfactory levels in Corn Belt soils. Corn growth and soil physical properties were determined in a field experiment in which different types alfalfa (Medicago sativa L.), cornstalks, sawdust, oat-straw (Avena sativa L.) and bromegrass (Bromus inermis Leyss) and amounts (from 0-16 tona/ha/yr) of plants residues were added to Marshall silty clay loam (Typic Hapludli) for 13 consecutive yr. The soil was cropped to corn and large amounts of N were added. For approximately the first 9 yr grain yields were lower from the check and sawdust treatments than from all others. During the last 4 yr grain yields declined sharply with rate of additions of cornstalk residues and slightly from additions of alfalfa. It is suggested that the yield decline in the cornstalk treatments was due to a lowering of pH and an Alinduced Ca deficiency in the plant. An alternative explanation is that the eation balance was upset as evidenced by K/Ca and K/Ca + Mg ration in the plant. The C content of the soil was progressively increased, as was the wet aggregate stability and water retention with rate of addition of organic material. Energy of aggregate rupture, energy to initial runoff, erosion, and infiltration were not significantly influenced. It was not visually evident that significant changes occurred in soil tith because of treatment differences. Marshall soils are well aggregated, have favorable physical problems are not usually observable in the field. Corn grain yields averaged near 7000 kg/ha (112 bu/acre) in the later years of the experiment, again suggesting that the physical properties of the soil on all treatments were favorable.—Copyright 1972, Biological Abstracts, Inc.

ENVIRONMENTAL INFLUENCES ON THE LEAF TEMPERATURES OF TWO SOYBEAN VARIETIES GROWN UNDER CONTROLLED IRRIGATION, Iowa State Univ., Ames. Dept. of Agricultural Cli-

matology.

R. E. Carlson, D. N. Yarger, and R. H. Shaw.
Agron J. Vol 64, No 2, p 224-229, 1972.
Identifiers: *Remote sensing, Glycine-Max-D, Irrigation, *Leaf temperatures, *Soybean-D, Transpiration.

Remote sensing techniques were used to give an indication of the plant's response to the environment. The relations between plant leaf temperatures and soil moisture stress and various environmental parameters were determined. Leaf temperatures (TL) of 2 soybean (Glycine max (L.) Merr.) varieties grown under controlled irrigation were measured with an infrared thermometer during a 9-day experiment. On a given day relative leaf water content (RWC) and TL were highly correlated. When TL's were examined over different days, vapor pressure deficit (VPD) and air temperature (TA) were found to affect TL. TL increased with decreasing values of both RWC and VPD. Interactions involving both VPD and TA with RWC were observed. TL increased with increasing TA; however, the amount of increase of TL seemed related to the leaf's level of RWC. This was related to increased transpirational cooling (stomatal conductivity) at higher levels of TA. The 2 varieties in this experiment were significantly different with respect to TL, but the degree of significance was related to VPD.—Copyright 1972, Biological Abstracts, Inc.

Department of Scientific and Industrial Research Christchurch (New Zealand). Crops Research Div.

N Z J Agric Res. Vol 15, No 1, p 43-47. 1972. Identifiers: *Crop response, *Moisture stress, Droughts, Injury, *Wheat m.

Death of some upper spikelets in ears of autumn-sown wheat under semi-drought conditions was at-tributed to moisture stress. It appears that the damage was produced by a few hours of stress 4 or 5 days before ear emergence. Among 80 medium-or late-maturing cultivars a third showed slight or moderate damage, and of those exposed to moisture stress at the critical stage of develop-ment, 9 were classed as resistant to drought injury and 17 as susceptible.—Copyright 1972, Biological Abstracts, Inc. W73-01877

POTASSIUM DEFICIENCY-INDUCED CHANGES IN STOMATAL BEHAVIOR, LEAF

CHANGES IN STOMATAL BEHAVIOR, LEAF WATER POTENTIALS, AND ROOT SYSTEM PERMEABILITY IN BETA VULGARIS L., Waite Agricultural Research Inst., Glen Osmond (Australia). Dept. of Agronomy.

R. D. Graham, and A. Ulrich.
Plant Physiol. Vol 49, No 2, p 105-109. 1972. Illus. Identifiers: "Boet-D, Beta-Vulgaris-D, Cells, Epidermis, "Leaf-water potential, Light, Mesophyll, Permeability, Petiole, "Potassium deficiency, Roots, "Stomatal behavior.

deficiency, Roots, "Stomatal behavior.

Studies of the water relations of K-deficient sugar-beet plants (Beta vulgaris L.) revealed 2 factors for stomatal closure. One component of stomatal closure was reversible by floating leaf discs on distilled water to relieve the water deficit in the leaves; the other component was reversible in the light by floating the leaf discs on CKI solution for 1 hr or more. K-activated stomatal opening in the light was observed when the guard cells were surrounded by their normal environment of epidermal and mesophyli cells, just as observed by previous workers for epidermal strips. Leaf water potentials, like stomatal apertures, appear to be strongly related to leaf K concentration. K-deficient plants have a greatly decreased root permeability to water, and the implications of this effect on stomatal aperture and leaf water potential are discussed. In contrast, petiole permeability to water is unaffected by K treatment.—Copyright 1972, Biological Abstracts, Inc.

W73-01880

EFFECT OF DIETARY EDTA ON THE ABILITY OF CHICKS TO TOLERATE SODIUM CHLORIDE IN THE WATER, Manitoba Univ., Winnipeg. Dept. of Animal

Science.
T. K. J. Cowan, G. D. Phillips, and D. B. Bragg.
Can J Anim Sci. Vol 51, No 3, p 633-637. 1971.
Identifiers: "Chicks, Dietary feed (Chickens),
"EDTA, Sodium chloride water, Weight, "Salt tolerance (Water).

Broiler chicks, allocated in a randomized block design, were fed 4 diets containing EDTA at 0, 0, 1, 0, 2 and 0.4% of the diet and drinking water with a high salt concentration (6000 ppm). A control group received tap water and the EDTA-free diet. The addition of 6000 ppm NaCl in the drinking water had no effect on weight gain or feed conversion. Similarly, the inclusion of up to 0.4% EDTA in the feed had no adverse effect on weight gain. Analyses of packed-cell volume (PCV) and plasma Na, Cl and Ca concentrations showed no changes as a result of treatment. Water consumption al-Na, CI and Ca concentrations showed no changes as a result of treatment. Water consumption almost doubled for the chicks subjected to high salt water regimes compared with the control. Two groups of chicks received the EDTA-free diet, and significantly (P less than 0.10) higher mortality was found for the group on the salt water compared with the tap water controls. The mortality in the former was also significantly (P less than 0.10) higher than for the group receiving 0.2% EDTA in the diet and salt water. The chicks on the 0.4% EDTA diet had significantly (P less than 0.05) higher mortality than control chicks on tap water and those chicks receiving salt water and diets containing 0.1% and 0.2% EDTA. Postmortem examination indicated that ascites and widespread edema were the causes of death in chicks that drank salt water and consumed diets containing no EDTA or 0.4% EDTA. The death of chicks on treatments that resulted in low mortality rates was treatments that resulted in low mortality rates was not attributable to ascites. The reason for the apparent beneficial effect of feeding 0.2% EDTA in the diet in conjunction with the salt water remains open to conjecture.—Copyright 1972, Biological Abstracts, Inc.

DRYLAND EVAPORATIVE FLUX IN A SUBHU-

MID CLIMATE: III. SOIL WATER IN-FLUENCE, Agricultural Research Service, Temple, Tex. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 02D. For primary W73-01883

CLIMATOLOGY OF A MOISTURE-STRESS CLIMATOLOGY OF A MOISTURE-STRESS INDEX POR IOWA AND ITS RELATIONSHIP TO CORN YIELDS, Iowa State Univ., Ames. Dept. of Agronomy. R. H. Shaw, and R. E. Felch. Iowa State J Sci. Vol 46, No 3, p 357-368. 1972. Il-

Identifiers: *Crop production, Climatology, *Corn, Index, *Iowa, *Moisture stress, Relationships, Soils.

The climatology of moisture stress in Iowa is presented and discussed. This information was based on a record of soil moisture for the state since 1954. The probability of various degrees of moisture stress occurring at various locations across the state are presented. The relationship between the moisture stress index and actual corn yields is discussed. With data from 10 different yields is discussed. With data from 10 different stations, the relationship between yield and moisture stress could be described by 3 regressions. Corn following meadow (M-C) relations in northwestern lowa were explained by one equation. All other M-C sites and all corn following corn (C-C) sites were separated into 2 groups depending upon the yield level when no stress occurred.—Copyright 1972, Biological Abstracts, Inc. W72.01982.

IRRIGATION OF BORDER STRIPS WITH CUT-

BACK STREAM, Haryana Agricultural Univ., Hissar (India). M. C. Agarwal, V. V. N. Murty, and B. K. Sharma. Indian J Agric Sci. Vol 41, No 3, p 259-264. 1971.

Identifiers: *Border strip method, *Cut-Back stream, *Irrigation.

In the border-strip method of irrigation, particularly in graded borders, it is necessary to stop the inflow of water when the water front reaches a particular length along the border so that the irrigation of the remaining length of the border is completed with the water already introduced into the border strip. Where adequate facilities for the removal of excess water from the tail end of the border are not available, such a practice facilitates ore uniform distribution of water. To determine experiment was conducted with various slopes and stream sizes. The points at which the cut back of stream would result in more uniform irrigation at different slopes and stream sizes are suggested.— Copyright 1972, Biological Abstracts, Inc. W73-01889 oint where the stream has to be cut back, an

EFFECT OF SOIL MOISTURE ON THE WATER EXCHANGE AND PRODUCTIVITY OF SOME HYBRID VARIETIES OF CORN. (IN BULGARI-

AN), Sofia Univ. (Bulgaria). Faculty of Biology.

God Sofilskiya Univ Biol Fak Kn Bot Mikrobiol Fiziol Biokhim Rast. 62: p 153-168. 1967/1968. Ger-

Identifiers: *Corn-M, Drought, Hybrid corn, Irrigation, *Soil moisture, *Crop productivity, Soils, Water retaining capacity.

Daily and ontog tic changes in the water frac-Daily and ontogenetic changes in the water frac-tion content and the water reserving capacity of the leaves of cultivars of hybrid corn 'Wir 42,' 'Wisconsin 641-AA,' 'Ohio-C 92' and 'Kansas 1859' were studied with and without irrigation. Without irrigation, a decrease of available water and water fixation at a pressure up to 18 atm was observed during the course of the day and observed during the course of the day and throughout the vegetation period. Under these conditions water retaining capacity increased and the fractions of structural water at 18 atm increased. Under irrigation the amount of general water and water fixed at 18 atm increased. Water retaining capacity and fractions of structural water at 18 atm decreased. Water activity in the tissues was higher and the productivity of the plant was also higher. The drought resistant cultivars 'Wir 22 and 'Wisconnis 641. AA 'had a higher degree of also higher. The drought resistant cultivars 'Wir 42' and 'Wisconsin 641-AA' had a higher degree of water structuralization and a high water retaining capacity and lower water activity. Their growth and productivity were lower.—Copyright 1972, W73-01894

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

HYDROGRAPHIC CHARACTERISTICS OF RIVER BASINS ON THE EUROPEAN USSR (GIDROGRAFICHESKIYE KHARAKTERISTIKI RECHNYKH BASSEYNOV YEVROPEYSKOY TERRITORII SSSR). Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR).

Gidrometeoizdat, Leningrad, V. V. Kupriyanov, editor, 1971, 100 p.

Descriptors: "Hydrography, "Data collections, "Hydrologic data, "River basins, "Watersheds (Basins), Rivers, Gaging stations, Lakes, Channels, Gradients (Streams), Slopes, Drainage area, Areal, Distance, Elevation, Bogs, Forests, Tundra, Maps, Measurement.
Identifiers: "European USSR, Barents Sea, White Sea, Baltic Sea, Black Sea, Sea of Azov, Caspian Sea, Hydrometric stations.

Hydrographic characteristics at 4,416 gaging sta-tions on 2,529 rivers in the European USSR are described. Procedures are recommended for determining these characteristics from topographic maps. Morphometric tabulations include linear maps. Morphometric tabulations include linear aspects of channel systems, areal aspects of drainage basins, and relief (gradient) aspects of drainage basins and channel networks. Areal density of hydrologic stations is indicated on riverbasin maps for the Barents and White Seas, Baltic Sea, Black Sea and Sea of Azov, and Caspian Sea. (Josefson-USGS) W73-01326

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control of Water on the Surface

SEDIMENTATION ASPECTS, PROJECT FOR NAVIGATION AND FLOOD CONTROL, LOWER COLORADO RIVER, TEXAS, Corps of Engineers, Washington, D.C. Committee on Channel Stabilization.
Por primary bibliographic entry see Field 02J. W73-01382

CONTROL OF EURASIAN WATERMILPOIL (MYRIOPHYLLUM SPICATUM L.) IN TVA RESERVOIRS (DRAFT ENVIRONMENTAL IM-PACT STATEMENT). Tennessee Valley Authority, Chattancoga. Office of Health and Environmental Section. For primary bibliographic entry see Field 05G. W73-01390

MIDLAND LOCAL PROTECTION PROJECT, LICKING RIVER, KENTUCKY (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Louisville, Ky. For primary bibliographic entry see Field 08D. W73-01394

CEDAR BAYOU, TEXAS (NAVIGATION) (FINAL ENVIRONMENTAL IMPACT STATE-MENT). Army Engineer District, Galveston, Tex. For primary bibliographic entry see Field 08A. W73-01395

MISSION BAY ENTRANCE CHANNEL DREDGING, SAN DIEGO RIVER AND MISSION BAY, SAN DIEGO COUNTY, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Los Angeles, Calif.

Available from the National Technical Information Service as EIS-CA-72-4489-D, \$3.25 in paper copy, \$0.95 in microfiche. April 1972. 15 p, 1 map, append.

Descriptors: *California, *Bavironmental effects, *Channel improvement, *Harbors, Operation and maintenance, Spoil banks, Beach erosion, Littoral drift, Recreation facilities, Beaches, Marinas, Boats, Navigation, Excavation, Turbidity, Beathos, Aquatic habitats, Safety, Waves (Water), Ocean waves, Bays, Dredging, Navigable waters, Project benefits, Project purposes. Identifiers: *Bavironmental Impact Statements, *Mission Bay entrance channel, *San Diego County (Calif).

This proposed navigation project consists of maintaining the Mission Bay, California, entrance channel and reestablishing authorized project depths. Maintenance dredging will be carried out in the future as needed. Dredged spoil will be used to replenish badily eroded adjacent beaches. Approximately 340,000 cubic yards of material will be dredged annually. The proposed maintenance dredging will eliminate the existing hazardous wave condition in the entrance channel and will provide for safe navigation of the entrance to Mission Bay by small craft. Adverse environmental effects include: loss of the bottom dwelling organisms of the entrance channel and their existing habitat; loss of the sandy beach organisms at both the Ocean Beach and Mission Beach disposal sites; and turbidity in the entrance channel and in the area of both beach disposal sites. The turbidity will temporarily disrupt the surrounding marine community and temporarily reduce the use of the areas for recreational activity. Alternatives considered include: no action, closing of the entrance channel, and dredging of the entrance channel. Comments from various interested agencies have been requested. (Ellis-Florida)

TRED AVON RIVER, TALBOT COUNTY, MARYLAND (DRAFT ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Baltimore, Md. For primary bibliographic entry see Field 08H. W73-01398

DALTON RESERVOIR, CONASAUGA RIVER, GEORGIA (DRAFT ENVIRONMENTAL IM-PACT STATEMENT). Army Engineer District, Mobile, Ala. For primary bibliographic entry see Field 08A. W73-01399

ILLINOIS BEACH ACQUISITION, LAKE COUNTY, ILLINOIS (DEAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Outdoor Recreation, Ann Arbor, Mich.

Available from the National Technical Information Service as EIS-IL-72-4658-D, \$3.00 in paper copy, \$0.95 in microfiche. June 2, 1972. 15 p, 1 map.

Descriptors: *Lake Michigan, *Environmental effects, *Parks, *Illinois, *Wisconsin, Water resources development, Recreation, Beaches, Land use, Land management, Natural resources, Recreation facilities, Social aspects, Conservation, Aesthetics, Recreation demand.
Identifiers: *Environmental Impact Statements, *Lake Courty (III).

This project involves the acquisition of approximately 980 acres along three miles of Lake Michigan shoreline between the City of Zion and the Illinois-Wisconsin border. The land will be developed for both active recreation and conservation purposes as an extension of the Illinois Beach State Park. The major impact of the project will be to reverse the gradual trend toward residential development and ultimately preserve it as open space and recreational land. The project will force the relocation of about 250 homes and remove some 980 acres from the tax rolls. With proper care in planning and developing the site little likelihood of any adverse environmental effects exists. Overall, the aesthetic qualities of the area will be improved and, except for limited areas of development, the area will be preserved as open space. Alternatives considered include a project of smaller scope, dedication of the entire area as a nature preserve, and no action. (Ellis-Florida) W73-01400

BOUND BROOK FLOOD CONTROL, SCITU-ATE, MASSACHUSETTS (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Corps of Engineers, Waltham, Mass. New England Div. For primary bibliographic entry see Field 08A. W73-01401

HIPES LAKE PROJECT, CRAIG CREEK, VIR-GINIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Norfolk, Va. For primary bibliographic entry see Field 08D. W73-01403

CIBOLO PROJECT, TEXAS (DRAFT ENVIRON-MENTAL IMPACT STATEMENT). Bureau of Reclamation, Amarillo, Tex. Region 5. For primary bibliographic entry see Field 08D.

MINNESOTA RIVER, MINNESOTA, MAN-KATO-NORTH MANKATO-LE HILLER FLOOD CONTROL, PHASE I FINAL EN-VIRONMENTAL STATEMENT). Army Engineer District, St. Paul, Minn. For primary bibliographic entry see Field 08D. W73-01405

CHICOD CREEK WATERSHED, NORTH CAROLINA (DRAFT ENVIRONMENTAL IM-PACT STATEMENT).
Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 64D. W73-01467.

MOUNTAIN PARK PROJECT, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATE-MENT). Bureau of Reclamation, Amarillo, Tex. Region 5. For primary bibliographic entry see Field 08A. W73-01469

ST. CATHERINE SOUND, MARYLAND (MAIN-TENANCE DREDGING) (DRAFT ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, Baltimore, Md.

Available from the National Technical Information Service as PB-207 565-D, \$3.00 in paper copy, \$0.95 in microfiche. February 15, 1972. 10 p, 2 map, 1 tab.

Descriptors: "Maryland, "Environmental effects, "Dredging, "Channel improvement, Potomac River, Excavation, Spoil banks, Hydraulic miniag, Commercial fishing, Rivers, Benthic fausa, Oysters, Commercial shellfish, Shellfish, Farming, Turbidity, Recreation, Boating, Channels, Disposal, Benthos. Identifiers: "Environmental Impact Statements, "St. Catherine Sound (Md).

St. Catherine Sound (Md).

The project involves the maintenance dredging of the St. Catherine Sound channels located 33 nautical miles upstream from the mouth of the Potomac River, and 62 miles downstream from Washington, D.C. The 20,000 cubic yards of dredge spoil will be placed on dry land disposal sites. The sound has been used primarily by commercial fishing interests and for increased recreational boating. While maintaining the carrying capacity of the channels for efficient movement of commercial and recreational navigation, the action will remove or disrupt pelagic and benthic organisms, and result in a temporary increase in turbidity near the dredge and disposal areas. Maintenance of the project will safeguard the waterway by reducing the probability of marine accidents. Some benthic organisms will be lost during dredging operations. Temporary turbidity and siltation from the hydraulic dredging process will be unavoidable. Alternatives include no action or disposal of spoil at other locations. They were rejected either for being more costly or causing economic losses. (Nielsen-Florida)

FLAT ROCK CREEK CHANNEL IMPROVE-MENT (LOCAL FLOOD PROTECTION PRO-JECT) TULSA, OKLAHOMA (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Army Bagineer District, Tulsa, Okla. For primary bibliographic entry see Field 08A. W73-01415

PELICAN BUTTE SPORTS DEVELOPMENT, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Forest Service (USDA), Portland, Oreg. Pacific Northwest Region.

Available from the National Technical Information Service as PB-207 570 D, \$3.00 in paper copy, \$0.95 in microfiche. March 17, 1972. 14 p.

Descriptors: *Oregon, *Environmental effects, *Winter sports, *Skiing, *Recreation facilities, Landscaping, Parks, National parks, Recreation wastes, Recreation, Waste disposal, Erosion,

Sheet erosion, Snow cover, Snow, Avalanches, Edge effects, Wildlife conservation, Vegetation regrowth.
Identifiers: "Environmental Impact Statements, "Palican Butte (Ore.).

*Pelican Butte (Ore.).

This project would provide a major winter sports development at Pelican Butte, located in southwest Oregon on the east slopes of the Cascade Range within Winema National Forest. Favorable effects from the proposed action are: (1) land coatrol over private lands in immediate vicinity of Pelican Butte, (2) year long recreational use accompanied by social and economic benefits, and (3) increased edge effects made by clearings with 'feathered' edges to minimize visual impacts. Adverse effects which cannot be avoided are impacts to the visual characteristics of the area, possible sheet erosion from a lack of sufficient revegetation, air pollution during construction stage, and increased population along with increase in sewage load and need for increased potable water. Other sites were considered for the project but Pelican Butte was selected as the best area for development because of its accessibility, minimal avalanche problems, high quality snow above 5,000 feet, favorable climate conditions, proximity to private land for support facilities, and other year around recreational facilities nearby. (Beardsley-Florida)

BREAKAGE OF FLOATING ICE BY COM-PRESSED GAS BLASTING, Cold Regions Research and Engineering Lab, Hanover, N.H. M. Mellor, and A. Kovacs. Available from NTIS, Springfield, Va 22151 as AD-730 303, \$3.00 in paper copy, \$0.95 in microfiche. July 1971. 50 p, 23 fig, 5 tab, 12 ref.

Descriptors: "Ice breakup, "Navigation, Explosives, Gases, "Testing procedures, Drilling, Carbon dioxide, Ice. Identifiers: "Compressed gas blasting, Blasting devices, Carbon dioxide shells.

devices, Carbon dioxide shells.

A feasibility study was made of compressed gas blasting for use as a potential method of disengaging sea ice around beset ships. Field tests were made with self-contained carbon dioxide shells, and with an airblasting system consisting of discharge shells and a high-pressure compressor. All the equipment was unmodified commercial equipment of the type used in the coal mining industry. The carbon dioxide shells were Cardox cartridges manufactured and serviced by the Long-Airdox Corporation. The airblasting equipment was an Airdox system, also manufactured by the Long-Airdox Corporation. Two sets of Cardox tests were made on a lake in New Hampshire. During the first series the average ice thickness was 13 in. and the snow cover was from 3 to 9 in. During the second series the average ice thickness was 19 in. and the snow cover 0 to 3 in. Airblasting tests were made at a lake on the Fort Wainswright military reservation near Fairbanks, Alaska. Ice thickness was 32.5 in. and the snow cover was 16 in. Water depth was 10 to 12 ft. The compressed gas shells are satisfactory for breaking ice up to about 20 in. thick. (Woodard-USGS)

TIDAL CURRENT TABLES, 1972, ATLANTIC COAST OF NORTH AMERICA.
National Ocean Survey, Rockville, Md.
For primary bibliographic entry see Field 07C.
W73-01506

THE EFFECTS OF WATER BODIES ON AIR TEMPERATURE AND HUMIDITY DURING THE PERIOD PRECEDING THEIR FREEZING OR OPENING, For primary bibliographic entry see Field 02H. W73-01511 INFLUENCE ON THE UPPER NIAGARA RIVER ICE BOOM ON THE CLIMATE OF BUFFALO, NEW YORK, State Univ., Coll., Buffalo, N.Y. Great Lakes Lab. For primary bibliographic entry see Field 02B. W73-01612

COMMON FEATURES OF THE RESERVOIR-A-SSOCIATED SEISMIC ACTIVITIES, National Geophysical Research Inst., Hyderabad (India). H. K. Gupta, B. K. Rastogi, and H. Narain. Bulletin of the Seismological Society of America, Vol 62, No 2, p 481-492, April 1972. 8 fig, 1 tab, 27

Descriptors: "Earthquakes, "Reservoirs, "Structural geology, Seismology, Land subsidence, Environmental effects, Impounded waters, Water storage, Stress, Seismic studies. Identifiers: "Earthquake-reservoir relationships.

A detailed examination of the behavior of carthquakes associated with over a dozen artificial lakes shows that, in all cases, the tremors were initiated or their frequency increased considerably following the lake filling and that their epicenters were mostly located within a distance of 25 km from the lakes. Among the factors affecting the tremor frequency are the rate of increase of water level, duration of loading, maximum levels reached, and the period for which the high levels are retained. The study of these reservoir-associated earthquake sequences reveals that the ratio of the largest aftershock to the main shock is high (about 0.9), and the b values are also high in the frequency-magnitude relation, which is contraty to the normal earthquakes of the concerned regions. (Knapp-USGS)

SOME DISCRIMINATORY CHARACTERISTICS OF EARTHQUAKES NEAR THE KARIBA, KREMASTA, AND KOYNA ARTIFICIAL LAKES,
National Geophysical Research Inst., Hyderabad

National Geophysical Research Inst., Hyderadad (India).
H. K. Gupta, B. K. Rastogi, and H. Narain.
Bulletin of the Seismological Society of America, Vol 62, No 2, p 493-507, April 1972. 12 fig. 4 tab, 20 act.

Descriptors: "Earthquakes, "Reservoirs, "Structural geology, Seismology, Land subsidence, Environmental effects, Impounded waters, Water storage, Stress, Seismic studies. Identifiers: "Earthquake-reservoir relationships, "Kariba Dam, "Kromasta Dam, "Koyna Dam.

The behavior of earthquakes near the artificial lakes at Kariba, Kremasta, and Koyna, where earthquakes of magnitude exceeding 6 have occurred, is examined. Foreshock-aftershock patterns of these earthquake sequences correspond with Mogi's type II model, whereas the normal earthquakes of these regions belong to type I. Three similar relations could be fitted in the time distribution of aftershocks of the main earthquakes. Quite contrary to normal earthquakes, foreshock b values are found to be comparable with the aftershock b values in the frequency-magnitude relations. Focal mechanisms of the largest earthquakes of these sequences have been determined and compared. Dip-slip components of the motion are such that the lakes are situated on the downthrown blocks. These regions are characterized by a volcanic past and the presence of rocks such as limestones and red boles which are easily affected by water. These findings are useful in distinguishing the reservoir-associated earthquakes from normal earthquakes and suggest that the artificial lakes are responsible for changing the mechanical properties of the strata and releasing the accumulated strains. (K-napp-USGS)

SEEPAGE ANALYSIS OF EARTH BANKS UNDER DRAWDOWN,
Army Engineer Waterways Experiment Station, Vickaburg, Miss.
C. S. Desai.
Journal of the Soil Mechanics and Foundations Division, American Society of Civil Engineers, Vol 98, No SMi1, Paper 9334, p 1143-1162, November 1972. 14 fig, 19 ref, append.

Descriptors: "Seepage, "Drawdown, "Finite element analysis, "Earth dams, "Bank stability, Dam design, Dam foundations, Phreatic lines, Soil mechanics, Laboratory tests, Hydraulic models, Numerical analysis. Identifiers: "Bank seepage.

The problem of transient unconfined seepage under drawdown in riverbanks and dams was solved by using a finite element procedure. An iterative procedure was employed to compute movements of the free surface caused by fluctuations in the external water levels. The finite element solutions were compared with laboratory experiments on a parallel-plate viscous flow model and field observations at a section along the Missispip River. Correlation between the numerical solutions and observations is good. Such special solutions and observations is good. Such special solutions and observations is good. Such special solutions and stuations at discretized end boundaries are discretization of infinite media and various possible flow situations at discretized end boundaries are discussed. Numerical formulations and computer codes yield acceptable accuracy with economy. Some projections for use of the method for design analysis are presented. (Knapp-USGS)

CHANNEL SURVEYING, Army Engineer District, Little Rock, Ark. J. M. Shields. In: Proceedings, American Congress on Surveying and Mapping, 32nd Annual Meeting, Washington, D.C. p 13-23, Mar 1972. 10 fig. 2 ref, append.

Descriptors: *Surveys, *Mapping, Chaanel improvements, Topographic surveys, Bank stabilization, Acrial surveys, Photogrammetry, Acrial photography, Topographic mapping, Topography, River training, Surveying instruments, Accuracy. Ideattifiers: Control surveys, Leveling.

Identifiers: Control surveys, Leveling.

Accurate surveys and adequate maps are essential for the planning, design, and construction of channel rectification and bank stabilization of a major river project. The major factors controlling the methods used in surveys are to secure the needed information with adequate accuracy or precision at minimum cost and, if possible, in a minimum amount of time. Neither unlimited time nor money can be spent to obtain perfect surveys. Thought, judgment, skill, experience, care, and honesty are necessary to execute surveys and survey computations. Care must be exercised to avoid even small errors; a procedure must be followed permitting continual checking to assure accurate work. Surveying is both a science and an art based on painstaking and systematic work executed with good judgment and good human relations. Without proper planning for all phases of a project, using modern techniques, and applying high accuracy standards in surveying and mapping, costly delays are likely to occur. (USBR)

W73-01738

ECONOMIC DAMAGE CAUSED BY AQUATIC WEEDS, PRELIMINARY SURVEY. Agency for International Development, Washington, D.C. Office of Science and Technology.

December 1971. 12 p, 7 ref.

Descriptors: "Aquatic weeds, "Economic impact,
"Damages, "Direct costs, Mosquitoes, Sewage
disposal, Flood control, Hydroelectric power,
Fishing, Water, Transportation, Transpiration.
Identifiers: "Developing countries, Bilharzia.

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control of Water on the Surface

An 'aquatic weed' is defined as any plant which has an inimical effect upon the physical and biological aquatic environment, with resultant economically damaging consequences. Species which are economically significant in some parts of the United States and in many developing countries include waterhyacinth, waterfern, waterfetuce, hydrilla, alligatorweed, and sedges. Aquatic weeds are responsible for several types of damage. Water evaporation losses are greatly accelerated by the large surface area presented by the leaves and other plant members. The water-air gas exchange is unbalanced by sizable floating weed mats, and weed masses often accelerate the breeding of mosquitoes and bilharzis analis. Aquatic weeds may interfere with sewage disposal and drainage systems, and reduce significantly water current flow velocity. Flood and general water control may be seriously hampered by the clogning of drains, diversionary canals, and flood control gates. Weed masses may also interfere with hydroelectric power plants. Finally, water transport and fishing are seriously restricted by aquatic weeds. The aquatic weed problems faced by Zambia, Thailand, and Guyana are briefly discussed. The study suggests that direct economic losses undoubtedly exceed \$100 million annually in developing countries. (Settle-Wisconsin)

PA MONG STAGE ONE PEASIBILITY RE-PORT, APPENDIX V, PLANS AND ESTI-MATES, VOLUME 2. Bureau of Reclamation, Washington, D.C. For primary bibliographic entry see Field 06C. W73-01803

FUNDAMENTAL STUDIES ON THE TILE DRAINAGE IN HEAVY SOILS: INVESTIGATION BY ELECTRICAL ANALOGUE METHOD, (IN JAPANESE), Hirosaki Univ. (Japan). Lab. of Land Reclamation and Engineering. For primary bibliographic entry see Field 02G. W73-01890

SMALL BOAT HARBOR, KING COVE, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field G8D.
W73-01904

ABSECON INLET, NEW JERSEY (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Philadelphia, Pa. For primary bibliographic entry see Field 08A. W73-01905

CHINA MEADOWS DAM AND RESERVOIR, LYMAN PROJECT, WYOMING (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Bureau of Reclamation, Salt Lake City, Utah. For primary bibliographic entry see Field 08D. W73-01909

ROYALTON LAKE-SALYERSVILLE AREA, LICKING RIVER BASIN, KENTUCKY (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Eagineer District, Louisville, Ky. For primary bibliographic entry see Field 08A.

DEBRIS REMOVAL, NORTH BRANCH CHICAGO RIVER, ILLINOIS (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Chicago, III.

Available from the National Technical Informa-tion Service as EIS-IL-72-4542-F, \$3.75 in paper copy, \$0.95 in microfiche. May 24, 1972. 32 p, 2

Descriptors: *Illinois, *Environmental effects, *Debris avalanches, *Stream improvement, Stream flow, Streams, Water quality control, Destrutification, Flood coatrol, Floods, Channels, Waste disposal, Degradation (Decomposition), Water quality, Recreation, Aquatic habitat, Flood recurrence interval. Identifiers: *Environmental Impact Statements, *Chicago River (III).

Chicago River (III).

The proposed action consists of clearing a 12 mile reach of the North Branch of the Chicago River, Cook County, Illinois of fallen trees, roots, ensanriments and unnatural objects. All debris and assorted refuse within the channel lines will be removed to approved disposal areas provided by a local cooperating agency. Most of the clearing will be accomplished by manual means and then the material will be transported by truck to the disposal areas. The project will improve the general appearance of the area; enhance recreational use in the parklands; allow the water to move faster, resulting in improved water quality; and reduce the recurrent flooding of the river. However, the proposed action will not climinate outfall sources of pollution which are major detrimental factors to water quality. The project may temporarily disturb some areas near the river banks but these areas will be restored following the clearing operation. Other alternatives considered are not as feasible as the proposed action. (Beardaley-Florida)

DEQUEEN LAKE, ROLLING FORK RIVER, ARKANSAS (FINAL ENVIRONMENTAL IMPACT STATEMEN).

Army Begineer District, Tulsa, Okla.

For primary bibliographic entry see Field 08D.

W73-01914

ROARING RIVER DAM AND RESERVOIR, YADKIN RIVER BASIN, NORTE CAROLINA (DRAFT ENVIRONMENTAL STATEMENT). Army Engineer District, Charleston, S.C. For primary bibliographic entry see Field 08A. W73-01915

RED RIVER OF THE NORTH AT OSLO, MIN-NESOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, St. Paul, Minn. For primary bibliographic entry see Field 08A. For primary W73-01917

COMPREHENSIVE BASIN STUDY, BIG MUDDY RIVER, ILLINOIS (DRAFT ENVIRON-MENTAL IMPACT STATEMENT). Water Resources Council, Washington, D.C. For primary bibliographic entry see Field 08A. W73-01919

MAINTENANCE DREDGING NOYO RIVER CHANNEL, NOYO HARBOR, MENDOCINO COUNTY, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, San Francisco, Calif.

Available from the National Technical Informa-tion Service as EIS-CA-72-4781-D, \$3.00 in paper copy, \$0.95 in microfiche. May 1972. 19 p, 1 map, 5

Descriptors: *Environmental effects, *California, *Harbors, *Dredging, Channels, Sediments, Siltation, Channel improvement, Rivers, Turbidity, Recreation, Rivers and Harbors Act, Fish, Marine fish, Bottom sediments, Vegetation, Habitats, Marine microorganisms, Oceans, Benthos, Maintenance, Navigation, Oxygen-reduction potential. Identifiers: *Pavironmental Impact Statements, *Mendocino County (California), *Noyo River Channel.

The proposed action involves the maintenance dredging of the entrance and river channels of Noyo Harbor. Approximately 50,000 cubic yards of material will be removed. Dredging operations will be conducted during the summer months to reduce potential damage to anadromous and marine organisms. Spoil material will be added to the littoral regime and deposited in an off-shore ocean disposal area. The removal of accumulated debris and shoaling deposits by dredging operations will result in restoring the harbor channel to the authorized 10 foot level. Favorable environments in anyigability and increased opportunities for the enhancement of sport fishing. Adverse effects include disturbance of channel bottom sedimentation with resulting increase in turbidity, temporary disruption of marine organisms caused by ocean disposal of sediment, and some smothering of marine benthic life due to the increased turbidity levels in excess of 2000 PPM. Alternatives considered include the land disposal of dredge material and a no-action solution. Land disposal would result in destruction of the vegetative cover and damage to riparian habitat. Due to a scarcity of land spoil disposal sites and the greater potential ecological harm this alternative was rejected. (Bradley-Florida)

PERIWINKLE CREEK RC AND D PROJECT MEASURE, UPPER WILLAMETTE RC AND D PROJECT, OREGON (DRAFT ENVIRONMEN-TAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C.

Available from the National Technical Informa-tion Service as EIS-OR-72-4717-D, \$3.00 in paper copy, \$0.95 in microfiche. May 10, 1972. 18 p, 1 map. 1 tab.

Descriptors: "Environmental effects, "Oregon, "Land management, "Plood protection, Water management (Applied), Recreation, Floodways, Sedimentation, Drainage, Wildlife, Fish, Structures, Channels, Runoff, Surface drainage, Surface waters, Groundwater, Water quality, Floodflow, Floodwater, Public health, Vegetation, Flood plains, Flooding, Vegetation effects, Wildlife habitats, Erosion, Food and cover crops. Identifiers: "Buvironmental Impact Statements, "Upper Willamette (Oregon), "Periwinkle Creek RC and D Project.

RC and D Project.

The proposed action contemplates land treatment and structural measures for flood protection, drainage, and recreational facilities in Linn County, Oregon. The project area encompasses approximately 7 square miles in the Periwinkle Creek area, currently experiencing land and water management problems. Land treatment measures include the construction of 4000 feet of drainage mains and laterals, construction of 13,200 feet of multiple purpose floodway, and the construction of 17,100 feet of channels with recreational facilities along the floodway. These measures are designed to improve the movement of surface water and regulate groundwater levels to reduce the flooding of cropiands. Environmental benefits include the reduction of overland flood flows, improvement of water quality through the removal of flood and drainage water, increased recreational water use, reduction of streambank sedimentation and erosion, and a reduction in public health problems through improved drainage facilities. Adverse environmental effects are limited to a temporary decrease in wildlife food and shelter, and some first-year downstream erosion and sedimentation. Alternatives considered included zonnels without recreational facility construction. (Bradley-Florida)

THE PERIPHERAL CANAL: THE CALIFORNIA MAJORITY VIEW. House, Washington, D.C.

WATER QUANTITY MANAGEMENT AND CONTROL-Field 04

Groundwater Management—Group 48

For primary bibliographic entry see Field 06E. W73-01934

WALKER DAM IMPOUNDMENT, AQUATIC PLANT CONTROL PROJECT, NEW KENT COUNTY, VIRGINIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.
Por primary bibliographic entry see Field 05G.
W73-01944

TUALATIN PROJECT, OREGON (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Bureau of Reclamation, Boise, Idaho. Region 1. For primary bibliographic entry see Field 68D. W73-01947

GULF INTRACOASTAL WATERWAY, MER-MENTAU RIVER, LOUISIANA (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, New Orleans, La. For primary bibliographic entry see Field 08A. W73-01948

NEWHALEM CREEK PROJECT, WASHING-TON (DRAFT ENVIRONMENTAL IMPACT STATEMENT), Seattle Dept. of Lighting, Wash. For primary bibliographic entry see Field 08C. W73-01950

4B. Groundwater Management

TEMPERATURE MEASUREMENTS OF GROUND AND WATER SURFACES BY AIR-CRAFT, ary bibliographic entry see Field 07B.

HYDRAULIC TESTS IN HOLE UAE-6H, AMCHITKA ISLAND, ALASKA, Geological Survey, Lakewood, Colo. For primary bibliographic entry see Field 08B. W73-01303

FEASIBILITY OF ARTIFICIALLY RECHARGING BASALT AQUIFERS IN EASTERN WASHINGTON, WASHING FOR, Geological Survey, Tacoma, Wash. A. A. Garrett, and C. J. Londquist. Geological Survey Open-file Report, 1972. 42 p, 4 fig, 1 tab, 7 ref.

Descriptors: "Artificial recharge, "Groundwater recharge, "Aquifers, "Injection wells, "Washing-ton, Methodology, Evaluation, Water wells, Pumping, Irrigation, Overdraft, Water spreading, Aquifer characteristics, Basalts, Costs.

Aquifer characteristics, Basalts, Costs.

Artificial recharge methods are evaluated as a means of augmenting natural recharge to offset the effects of intensive pumping of groundwater in parts of easters Washington. Groundwater in altival fill in the coulees is considered the most suitable source of water for artificial recharge. This shallow groundwater, replenished periodically by surface flow, is likely to contain little sediment and dissolved air, which have been clogging agents in previous injection operations. Of 22 townshipsize areas where overdraft is evident, only three were considered technically suited to an artificial recharge program. For use of water from Crab Craek valley, the estimated cost of artificial recharge ranges from about \$6 per acre-foot (1970 values) for recharging 6,000 acre-feet per year to about \$4 per acre-foot (1970 values) for recharging 6,000 acre-feet per year if the source and injection sites were both on the valley floor (the most favorable situation). (Woodard-USGS)

DEPTH TO WATER TABLE, HARTFORD NORTH QUADRANGLE, CONNECTICUT, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W73-01312

GROUND-WATER FOLLUTION IN THE VICINITY OF TOLEDO BEND RESERVOIR, TEXAS, PROGRESS REPORT, 1972, Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 05B. W73-01318

GROUNDWATER RESOURCES OF SIBERIA AND SOVIET FAR EAST (RESURSY PODZEM-NYKH VOD SIBIRI I DAL'NEGO VOSTOKA), Akademiya Nauk SSSR, Irkutak. Institut Zemnoi

Kory. S. S. Bondarenko, L. V. Borevskiy, V. A. Vsevolozhskiy, I. S. Zektser, and B. I. Kudelin. Geologiya i Geofiziki, No 3, p 28-37, March 1972.

Descriptors: "Hydrogeology, "Groundwater, "Groundwater resources, Water supply, Water types, Freshwater, Saline water, Brines, Mineral water, Industrial water, Thermal water, Aquifers, Base flow, Permafrost, Geologic time, Estimating. Identifiers: "USSR, "Siberia, "Soviet Far East, Balneology, Tectonics, Mineralization, Artesian basins.

The occurrence and geographical distribution of groundwater in Siberia and the Soviet Far East are investigated in connection with ever-increasing needs for public and industrial water supplies. Determination and appraisal of groundwater resources are based on quantitative estimates of fresh and saline waters for domestic and municipal purposes and of mineral waters for satisfying medicinal, industrial, and thermal-energy requirements. Guidelines are proposed for acquiring groundwater data for use in development and management of groundwater resources of the area. (Josefson-USGS)

HYDROGEOLOGY, HYDROCHEMISTRY, AND GEOTHERMAL STUDIES OF GEOLOGIC STRUCTURES (GIDROGEOLOGIYA, GIDROK-HIMIYA, CEOTERMIYA GEOLOGICHESKIKH STRUKTUR), Akademiya Navuk BSSR, Minsk. Institut Geok-himi i Geofiziki. For primary bibliographic entry see Field 02F. W73-01328

GROUNDWATER-AN IMPERATIVE IN WATER RESOURCES PLANNING, National Water Well Association, Columbus, J. H. Lehr.

J. H. Lehr.

Proceedings available from Engineering Pub. Office, Ill. Univ., 112 Engineering Hall, Urbana 61801; Price \$6.50. In: Proceedings of 14th Water Quality Conference on Groundwater Quality and Treatment, February 9-10, 1972, Illinois University Department of Civil Engineering, Urbana: University of Illinois Bulletin, Vol 69, No 120, p 1-5, May 26, 1972.

Descriptors: *Water resources development, *Groundwater resources, *Water supply, Water demand, Municipal water, Water quality, Illinois.

Groundwater supplies are often a forgotten alternative in municipal and industrial water resources planning. Thorough engineering and economic studies prove that groundwater is often a high-quality, low cost alternative to surface water. The advantages of minimum evaporation, stable quality, quantity, and temperature, plus small land costs coupled with significantly lower construction costs as compared to surface water, far exceed the disadvantages of the slow response time, pumping

requirements, small recreational side benefits, and inherent invisibility of groundwater. These facts make it imperative for groundwater to be thoroughly understood by the planners and the public in general. (Knapp-USGS)

GROUNDWATER DEGRADATION-CAUSES AND CURES, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 05B. W73-01339

EFFECT OF NITROGEN COMPOUNDS IN WELL WATER ON A CHILD, Polskie Towarzystwo Pediatryczne, Warsaw (Po-For primary bibliographic entry see Field 05C. W73.01372

EAST GREENACRES UNIT, PRAIRIE DIVI-SION, RATHDRUM PRAIRIE PROJECT, IDAHO (FINAL ENVIRONMENTAL IMPACT BARIO (FINAL ENVIRONMENTAL IMPA STATEMENT). Bureau of Reclamation. Boise, Idaho. Region 1. For primary bibliographic entry see Field 08B. W73-01396

GUIDE TO USERS OF GROUND WATER IN BAY COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 07C. W73-01502

GEOCHEMISTRY OF FLUORINE IN WATERS OF CARBONIFEROUS DEPOSITS OF THE MOSCOW ARTESIAN BASIN (GEOKHIMIYA FTORA V VODAKH KARBONA MOSKOV-SKOGO ARTEZIANSKOGO BASSEYNA), FOR primary bibliographic entry see Field 02K. W73-01523

THE WATER PROBLEM IN RELATION TO MINING AT KONKOLA DIVISION, NCHANGA CONSOLIDATED COPPER MINES LIMITED, Nchanga Consolidated Copper Mines Ltd., Kon-kola (Zambia). kola (Zambia). J. H. A. Rijken, and J. M. Clutten. Geologie en Mijabouw (Netherlands), Vol 51, No 3, p 399-408, May-June 1972. 4 fig, 2 tab.

Descriptors: *Mine water, *Dewatering, *Inflow, *Mine drainage, Africa, Water yield, Hydrogeolo-gy, Pumping, Aquifer characteristics. Identifiers: *Zambia.

Identifiers: *Zambia.

Nchanga Consolidated Copper Mines Limited, Konkola Division is the wettest mine on the Zambian Copperbelt and probably the second wettest in the world. The stratigraphic position of the orebody, between the Hangingwall and Footwall Aquifers, results in large quantities of controllable and uncontrollable water flowing into the workings during mining operations. In 1970 an average of 340,000 cubic meters per day were pumped to surface, equivalent to 64 tons of water per ton of ore hoisted. Sufficient pumping capacity has to be installed to lower the water table in the various aquifers in time to meet production commitments. The sustained capacity for 1972 will be in the region of 600,000 cubic meters per day. Dewatering of the various aquifers is achieved by drilling boreholes and by driving mining headings into the aquifers. The problem of recharge is not yet solved and research in this field is in progress, including color and infrared aerial photographic surveys, chemical and neutron activation analyses of waters, regional water balance studies, and age determinations of waters by natural isotope analysis. (Knapp-USGS)

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B-Groundwater Management

GEOHYDROLOGIC WELL-LOGGING, Royal Inst. of Tech., Stockholm (Sweden). Dept. of Land Improvement and Drainage. H. Houtkamp, and G. Jacks. Nordic Hydrology, Vol 3, No 3, p 165-182, 1972.

Descriptors: *Borehole geophysics, *Electrical well logging, Exploration, Groundwater, Hydrogeology, Aquifer characteristics, Aquifer testing, Water yield. Identifiers: *Sweden.

Well logs have been used in Sweden to gain geohydrologic information in Precambrian rocks. The logs used are the self-potential, the diameter, the temperature, and the electric conductivity of water. Applications include general information on the occurrence of groundwater in hard rocks. The logging technique seems to be of particular value in connection with underground constructions in rock when detailed local information is necessary in order to avoid groundwater leakage even in minor quantities. (Knapp-USGS)

HYDROLOGIC BOUNDARY ANALYSIS IN BASALTIC AQUIFERS, Geological Survey of India, Nagpur. Ground Water Div. For primary bibliographic entry see Field 02F. W73-01770

4C. Effects on Water of Man's Non-Water Activities

WATER QUALITY AT MIAMI INTERNA-TIONAL AIRPORT, MIAMI, FLORIDA, 1971-7-72, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 05B. W73-01513

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE BRYAN, TEXAS METROPOLITAN AREA, 1976, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 07C. W73-01729

GUIDELINES FOR EROSION AND SEDIMENT CONTROL PLANNING AND IMPLEMENTA-TION, Hittman Associates, Inc., Columbia, Md. For primary bibliographic entry see Field 04D. W73-01773

FACTORS AFFECTING WATER MANAGE-MENT ON THE NORTH SLOPE OF ALASKA, Alaska Univ., College. Inst. of Water Resources. J. K. Greenwood, and R. S. Murphy. Sea Grant Report No 72-3, February 1972. 42 p, 6 fig, 41 ref, 3 append. 1-36109.

Descriptors: "Water pollution, "Water management (Applied), "Ecology, Oil, Oil reservoirs, Regional development, Environmental effects, Management, Water resources, Alaska. Identifiers: "North Slope, Economic development

The North Slope of Alaska is undergoing sudden development following the recent discovery of large oil and gas reserves. The likely environmental effects of this development are poorly understood. Understanding of these effects can be improved through (1) broad ecological studies aimed at establishing the most important areas for preservation, and (2) pilot-sized field tests

designed to assess the overall effects on a stream of various levels and patterns of waste disposal. The best way to protect the North Slope's water resources would be to develop regional management procedures and philosophies encompassing all water-related activities. Little is known about the ecological importance of, say, a lake or stretch of tundra. However, a regional management board could compensate for this ignorance by preserving stiff operating standards and low development levels over most of the North Slope. Probably, only small areas of the arctic tundra would ever be zoned for any significant level of disturbance. Appendices briefly discuss (1) regional water management and zoning in the continental United States, (2) economic incentives for controlling pollution, and (3) the relevance of benefit-cost analysis to arctic water planning. (Settle-Wisconsin) W73-01798

4D. Watershed Protection

PROCEEDINGS MISSISSIPPI WA RESOURCES CONFERENCE, 1972. For primary bibliographic entry see Field 02J. WATER

VARIATIONS IN RUNOFF AND SEDIMENT YIELDS OF TWO ADJACENT WATERSHEDS AS INFLUENCED BY HYDROLOGIC AND PHYSICAL CHARACTERISTICS, Agricultural Research Service, Oxford, Miss. Sedimentation Lab. For primary bibliographic entry see Field 02J. W73-01320

PRACTICAL GUIDANCE FOR ESTIMATING AND CONTROLLING EROSION AT CULVERT OUTLETS, Army Engineer Waterways Experiment Station.

OUTLETS, Army Engineer Waterways Experiment Station, Vicksburg, Miss. B. P. Fletcher, and J. L. Grace, Jr. In: Proceedings of Mississippi Water Resources Conference, April 11-12, 1972; Mississippi Water Resources Research Institute Publication, p 137-173, 1972. 23 fig, 3 tab, 6 ref.

Descriptors: *Erosion control, *Scour, *Culverts, *Outlet works, Erosion, Storm drains, Settling basins, Drops (Structures), Design flow, Hydraulic models, Riprap, Stream erosion, Bank protection, Linings.

Results are summarized of research conducted during the past 9 years to develop practical guidance for estimating and controlling crosson downstream of culvert and storm-drain outlets. Initial efforts were concerned with means of estimating the extent of scour to be anticipated downstream of outlets. Subsequent efforts involve schemes for controlling crossion such as horizontal blankets of rock riprap, preformed scour holes lined with rock riprap, and channel expansions lined with natural and artificial revetments. In addition, limiting discharges were found for various energy dissipators including simple flared outlet transitions, stilling wells, U.S. Bureau of Reclamation type VI basins, and St. Anthony Falls stilling basins. Empirical equations and charts are presented for estimating the extent of localized scour to be anticipated downstream of culvert and storm-drain outlets, the size and extent of revetments, and the maximum recommended discharge for each type of energy dissipator investigated. (See also W73-01317) (Knapp-USGS)

THE EROSION CONTROL EFFICIENCY OF SYNTHETIC POLYMERS ON IRRIGATED DARK CHESTNUT SOILS IN THE ALMA-ATA OBLAST, UR RUSSIAN, N. S. Popova, and N. S. Mitrofanova.

Tr Inst Pochvoved Akad Nauk Kaz SSR 19: p 243-

250. 1970.
Identifiers: *Erosion control, *Polymers, Actinomycetes, Aggregates, Alma-Ata Oblast, Bacteria, Chestnut soil, Composition, Corn, Density, Brosion, Percolation, Irrigation, Porosity, Rates, Soils, USSR, Crop response, Crop production.

The polymers K-4 and PAA in doses of 0.05-0.1% increased the quantity of water-resistant aggregates 1.5-2 times in comparison to the control, improved the aggregate and microaggregate composition of soil, raised the percolation rate of water, reduced the density, increased the porosity, made for a more prolonged retention of water in the arable layer, sharply reduced erosion by irrigation, resulting in larger yields of green mass of corn. The preparation K-4 intensified the activity of nitrifying bacteria; a dose of 0.05% increased the relative presence of bacteria and action-mycetes, while a dose of 0.1% inhibited the ammonifiers. The preparations may be used for erosion control in irrigated agriculture.—Copyright 1972, Biological Abstracts, Inc.

CHICOD CREEK WATERSHED, NORTH CAROLINA (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C.

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Available from the National Technical Informa-tion Service as PB-208 299-D, \$3.00 in paper copy, \$0.95 in microfiche. April 1972. 43 p, 3 map, 2 dwg,

Descriptors: *Environmental effects, *Channel improvement, *Land management, *Watershed management, *Watersheds (Basins), Wetlands, Drainage, Flood, Silood plains, Flood control, Soil profiles, North Carolina, Land reclamation, Flood protection, Water conservation, Natural streams, Water quality control. Identifiers: *Environmental Impact Statements, *Chicod Creek (NC). *Chicod Creek (NC).

The proposed project in the Chicod Creek Watershed in Beaufort and Pitt Counties, North Watershed in Beaufort and Pitt Counties, North Carolina, includes conservation land treatment, 66 miles of channel improvement, two wetland preservation areas, one 12.4 acres warmwater impoundment, 11 rock dams, 30 vater control structures, and 10 sediment traps. Favorable environmental effects would include a reduction in soil loss, improved waster quality, improved aesthetic and environmental values, improved soil profile drainage and decreased flooding, more access to fishing waters, increased per acre yield of crop, reduced production costs, and increased net income by 3300 per farm annually. Adverse environmental effects would include temporary increased sedimentation during construction, loss of change of habitat on 657 acres of wetland and 360 acres of hardwood; temporary loss of five miles of stream fishery habitat; and a reduced carrying capacity of 14 miles of stream habitat, including loss of cover, loss of change loss of cover, loss of stream Carolina, includes conservation land treatment, 66

PLAQUEMINE LOCK CLOSURE, MISSISSIPPI RIVER AND TRIBUTARIES PROJECT, IBERVILLE PARISH, LOUISIANA (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, New Orleans, La. For primary bibliographic entry see Field 08D. W73-01413

PRICKETT CREEK WATERSHED, WEST VIR-GINIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C.

Available from the National Technical Informa-tion Service as PB-208 385-D, \$3.00 in paper copy, \$0.95 in microfiche. December 1971. 13 p, 1 map, 1 tab.

Descriptors: "West Virginia, "Watershed management, "Flood protection, "Environmental effects, Floods, Flood control, Flood plains, Flood plain insurance, Levees, Flood walls, Flood profins, Watersheds (Basins), Erosion control, Channel improvement, Channels, Flood plain zoning, Land management, Erosion, Ohio River, Sediment control, Watershed Protect, and Flood Prev. Act. Identifiers: "Environmental Impact Statements, "Prickett Creek Watershed (W Va).

Prickett Creek Watershed (W Va).

The proposed project in Marion and Taylor Counties, West Virginia, consists of conservation land treatment measures, a single-purpose floodwater retarding structure, and 7,030 feet of channel work including levees, floodwalls, and stream channel improvement. The project will provide flood and sediment protection from floods occurring on the average of every five years in the watershed and downstream areas of the Monongahela and Ohio Rivers and stabilization of critically eroding areas. The project will also create about 30 acres of warm water fisheries. Adverse environmental effects include: relocation of 17 houses, five mobile homes and other improvements; elimination of 3,500 feet of free-flowing stream; creation of more vehicular traffic, noise, and litter; temporary increase of turbidity and sedimentation of stream water during construction; increased fire hazard to watershed lands; and decreased protective vegetation. Alternatives are: no action, flood proofing, flood plain management, flood insurance, land treatment measures only, and several combinations of structural measures. (Wheeler-Florida) W73-01414

MECHANICS OF SOIL EROSION FROM OVER-LAND FLOW GENERATED BY SIMULATED RAINFALL, Colorado State Univ., Fort Collins. Dept. of Civil

Engineering.
For primary bibliographic entry see Field 08D.
W73-01504

PREVENTION AND CONTROL OF EROSION OF IRRIGATED LAND BY WATER (PREDOT-VRASHCHENIYE VODNOY EROZII I BOR'BA S NEYU NA OROSHAYEMYKH ZEMLYAKH), I. A. Dzyadevich. Gidrotekhnika i Melioratsiya, No 9, p 40-56, Sep-tember 1970. 12 fig, 4 tab, 12 ref.

Descriptors: "Soil erosion, "Erosion control, "Erosion rates, "Irrigated land, "Irrigation practices, Irrigation systems, Irrigation canals, Irriga-tion ditches, Irrigation water, Irrigation, Drainage, Soil management, Crop production, Sheet erosion, Rill erosion, Gully erosion, Mudflows, Flood-

Identifiers: *USSR, *Irrigated agriculture, Ero-sion classes, Erodibility, Erosion hazard.

In the March 1967 decree of the Central Commit-tee of the Communist Party and USSR Council of Ministers concerning 'Urgent Measures for Con-trol of Soil Erosion by Wind and Water,' soil ero-sion control was considered a major problem confronting the Soviet Government in its efforts to in-crease agricultural production. Because of large-scale erosion on irrigated lands and lack of scale erosion on irrigated lands and lack of widespread information pertaining to development of this phenomenon, the All-Union State Water Management Trust (Soyuzvodproyekt) and Ukrainian State Institute for Planning of Water Management Structures and Rural Electric Power

Plants (Ukrgiprovodkhoz) were assigned the task of studying soil erosion by water on irrigated lands for the period 1968-69 and of reporting their findings. Three types of erosion processes on ir-rigated land are discussed: (1) sheet erosion, characterized by removal of a layer of soil from characterized by removal of a layer of soil from the land surface by irrigation water and frequently accompanied by development of small water channels; (2) rill erosion, identified by removal of soil through the cutting of small but conspicuous water channels, which, if uncontrolled, form gullies; and (3) erosion produced by mudflows and floodwaters, resulting in removal of soil from irrigated plots, deposition of mud and silt on fertile soils, and in destruction of irrigation and drainage systems. Practical measures are outlined for reduction and prevention of erosion by water in irrigated agriculture. (Josefson-USGS) W73-01519

ENVIRONMENTAL IMPROVEMENT THROUGH WATERSHED PROGRAMS, Senate, Washington, D.C. Senate, Washington, D.C.
For primary bibliographic entry see Field 06E.

GUIDELINES FOR EROSION AND SEDIMENT CONTROL PLANNING AND IMPLEMENTA-

CONTROL PLANNING AND INFLORMANCE TION,
Hittman Associates, Inc., Columbia, Md.
B. C. Becker, and T. R. Mills.
Copy available from GPO Sup Doc as
EPI.23/2:72-015, \$1.75; microfiche from NTIS as
PB-213 119, \$0.95. Environmental Protection
Technology Series EPA-R2-72-015, August 1972.
228 p, 140 fig, 5 ref. EPA 15030FM/2.

Descriptors: "Sediment control, "Erosion control, "Urbanization, "Urban hydrology, "Land management, Maryland, Land development, Construction, Building codes, Road construction, Cities, Soil conservation, Planning, Water control, Soil erosion, Sediment transport.

Identifiers: Erosion control guidelines.

This is the first of three major documents as part of 'Joint Construction Sediment Control Project' being conducted in Columbia, Maryland. This probeing conducted in Columbia, Maryland. This project is operated by the Maryland Department of Water Resources under an Environmental Protection Agency grant. The principal purpose of the guidelines is to help those engaged in urban construction prevent the uncontrolled movement of soil and the subsequent damage it causes. A comprehensive approach to the problem of erosion and sediment control provides: (1) A description of how a preliminary site evaluation determines what potential sediment and erosion control problems exist at a site being considered for development, (2) Guidance for the planning of an effective sediment and erosion control plan, and (3) Procedures for the implementation of that plan during operations. Technical information on 42 sediment and techniques is contained in four appendices. In addition, a cross-index and a glossary of technical terms used in the document are provided. (Woodard-USGS) ject is operated by the Maryland Department of

LAKE FOREST BEACH EROSION, ILLINOIS (FINAL ENVIRONMENTAL IMPACT STATE-MENT). Army Engineer District, Chicago, Ill.

For primary bibliographic entry see Field 08A. W73-01906

SEDIMENT CONTROL BILL (S.3910), Senate, Washington, D.C. For primary bibliographic entry see Field 06E.

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

TRACE ELEMENTS IN SOILS, PLANTS, AND WATER OF THE SOUTHERN PART OF WESTERN SIBERIA (MIKROELEMENTY V WESTERM SIBERIA (MIRROELEMENTY V POCHYAKH, RASTITEL'NOSTI I VODAKH YUZHNOY CHASTI ZAPADNOY SIBERI). Novosibirak Inst. of Agrochemistry and Soil Science (USSR). For primary bibliographic entry see Field 02K. W73-01329

GEOCHEMICAL CONTROLS OF GROUND-WATER QUALITY, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 02K. For primar W73-01338

PONTOPOREIA AFFINIS (CRUSTACEA, AM-PHIPODA) AS A MONITOR OF RADIOACTIVI-TY IN LAKE MICHIGAN, Michigan Uaiv., Ann Arbor. For primary bibliographic entry see Field 05B. W73-01378

INFRARED SPECTROGRAPHY OF THE BITU-MENS EXTRACTED OF CAL HYDROMORPHIC SOILS, Poitiers Univ. (France). Faculte des Sciences. For primary bibliographic entry see Field 02K. W73-01392

USING THE RESPIRATORY RESPONSES OF USING THE RESPIRATORY RESPONSES OF BLUEGILL SURFISH (LEPOMIS MACHROCHIRUS RAFINESQUE) TO MONI-TOR ZINC CONCENTRATIONS IN WATER, Virginia Polytechnic Inst. and State Univ., Blacksburg. R. E. Sparks. Available from Univ. Microfilms, Inc., Ann Ar-sen Mich. 48106 O. Microfilms, Inc., Ann Ar-

bor, Mich., 48106, Order No. 71-28,957. Ph. D. Thesis, 1971, 41 pp.

Descriptors: *Fish, *Respiration, *Zinc data processing, *Heavy metals, Sunfish, Water analysis, *Monitoring, Lethal limits, Toxicity, Mere pollution effects, Industrial wastes, Bioassay, Mortality, Laboratory equipment.

Identifiers: Lepomis macrochrius, Recorders.

Identifiers: Lepomis macrochrius, Recorders.

A timer-controlled Grass 5-D polygraph made recordings hourly or half-hourly of breathing signals from 52 bluegill sunfish exposed to continuous flows of dechlorinated Blacksburg lap water containing zinc concentrations of 8.7, 5.22, 4.16, or 2.55 mg/l at a temperature of approximate-ly 20 degree C. The breathing of the fish was monitored successfully with three electrodes in the water, none attached to the fish. Two of five fish exposed to a zinc concentration of 8.7 mg/l died within 96 hours. The fish showed responses to all of the above concentrations of zinc. The criterion for a response by a fish was a breathing rate which exceeded the maximal breathing rate observed before any zinc was added, or breathing rate variances which were heterogeneous. In general as the criterion for detection increased from a response by a single fish to stimultaneous response by a theast three fish, the number of false detections which occurred before any zinc added decreased, and the lag between the time of zinc introduction increased. With modifications to automate the collection and analysis of data, the apparatus could be used to monitor continuously the effects of certain wastes on fish in an industrial plant. (Mortland-Battelle)

Group 5A-Identification of Pollutants

A TAXONOMIC STUDY OF THE FAMILY BAC-TERGIDACEAE, North Texas State Univ., Denton. N. R. Funderburk. Available from Univ. Microfilms, Inc., Ann Ar-bor, Mich., 48106 Order No. 72-4076. Ph. D. Thesis. 1971, 100 p.

Descriptors: "Systematics, "Anaerobic bacteria, "Pathogenic bacteria, Bacteria, Bacteriophage, Coliforms, Electron microscopy, Microscopy, Cultures, Growth rates, Inhibitors, Hydrogen ion concentration, Isolation. Identifiers: "Bacteroidaceae, Biochemical charac-terics, Differential media.

terics, Differential media.

This study was performed to clarify the taxonomy of the bacteria in the family Bacteroidaceae. Recently the production of butyric acid has been proposed to divide the family into two genera. Other studies have defined genera by using tests for inhibition of growth by bile, final pH of cultures in glucose broth, susceptibility to antiobiotics, propionate production from threonine, and determination of dehydrogenase enzymes after electrophoretic separation of cell proteins. Thirty-four strains were used in this study to evaluate these criteria, as well as to evaluate the use of tests for dehydrogenation of amino acids and other organic acids. In addition, the isolation of bacteriophages which were lytic for strains of the bacterioles and their use in classification were investigated. Characterization of these bacteriophages was performed by host range specificity studies, and by electron microscopic determinations of sizes and shapes. The results of these studies indicated that the family Bacteroidaceae could be divided into five groups. Evidence for the close relationship of organisms within each of these groups was obtained from morphological and Biochemical evidence, as well as the bacteriophage lytic spectra. (Holoman-Battelle) telle) W73-01431

A STUDY OF THE RELATIONSHIP BETWEEN CHEMICAL WATER QUALITY AND FISH AND BENTHIC MACROINVERETEBRATE DIVERSI-TY IN FRENCH CREEK, CHESTER COUNTY,

PENNSYLVANIA,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 05C.

THE EFFECTS OF THE SMITH MOUNTAIN PUMP STORAGE PROJECT ON THE FISHE OF THE LOWER RESERVOIR, LEESVILLE,

OF THE LOVING THE CONTROL OF T

THE ECOLOGICAL ENERGIES OF GROWTH, RESPIRATION AND ASSIMILATION IN THE INTERTIDAL AMERICAN OYSTER, CRASSOS-TREA VIRGINICA (GMELIN), South Carolina Univ., Columbia. For primary bibliographic entry see Field 05C. W73-01437

ECOLOGY OF THE DIATOM COMMUNITY OF THE UPPER EAST GALLATIN RIVER, MON-TANA WITH IN SITU EXPERIMENTS ON THE EFFECT OF CURRENT VELOCITY ON FEA-TURES OF THE AUFWUCHS, Montana State Univ., Bozeman.
For primary bibliographic entry see Field 05C.
W73-01438

COMPUTER-ASSISTED GAS CHROMATOG-RAPHY, Purdue Univ., Lafayette, Ind. For primary bibliographic entry see Field 07C.

W73-01440

TRACE INORGANIC ANALYSIS, Missouri Univ., Kansas City. H. K.-Y. Lau. Available from Univ. Microfilms, Inc., Ann Ar-bor, Mich., 48106 Order No. 72-201. Ph, D. Thesis, 1971, p 163.

Descriptors: *Trace elements, *Metals, Gravimetric analysis, Fluorometry, Separation techniques, Solvents, Hydrogen ion concentration, Instrumentation, Water analysis, Radioactivity techniques, Ions, Heavy metals, *Spectrophotometry. Identifiers: *Palladium, *Selenium, *Bismuth, Radiometry, Chemical interference, Ligands, Atomic absorption spectrophotometry.

Atomic absorption spectrophotometry.

This study was undertaken to evaluate the usefulness of radioactive organic ligands for trace inorganic analysis. Methods were developed for the determination of palladium, Selenium and bismuth. Five analytical procedures: gravimetric, spectrophotometric, radiometric, fluorometric and atomic adsorption methods, have been developed for the analysis of macro to submicro amounts of palladium. The analysis is based on the reaction of palladium. The analysis is based on the reaction of PdC12 with 2,1,3-naphtho (2,3-c)-selenadiazole, which was found to be a very selective reagent for palladium. Analytical conditions such as the reaction time, concentration ranges, effect of variations in pH and of the presence of 68 foreign ions, and solvent extraction techniques, were studied. An indirect atomic absorption method was developed for the determination of selenium in trace quantities based on two selective reactions that led to the formation of selenium in trace quantities based on two selective reactions that led to the formation of selenium oncentration in the sample is indirectly determined oby measurement of the palladium absorption. Reaction conditions, separation techniques, effect of foreign ions, instrumental conditions as well as sample analyses in the sub-parts per million range of selenium are described. Thi and lead generally interfere in spectrophotometric bismuth determinations; moreover, chemical interference habeen reported when aqueous bismuth samples are determined directly by atomic absorption spectrophotometry. Using the ammonium salt of 1-pyrrolidinecarbodithioic acid (APDC) and organic extractants, a spectrophotometric method and an atomic absorption procedure have been developed for the determination of bismuth in the presence of a large number of foreign ions, and in lead and tin-base alloys. (Mortland-Battelle)

STRUCTURAL AND FUNCTIONAL ASPECTS OF A SUBLITTORAL COMMUNITY, Georgia Univ., Athens. For primary bibliographic entry see Field 05C. W73-01443

GROWTH AND PHOSPHATE REQUIREMENTS OF NITZSCHIA ACTINASTROIDES (LEMM.) V. GOOR IN BATCH AND CHEMOSTAT CULTURE UNDER PHOSPHATE LIMITATION, (WACHSTUM UND PHOSPHATEBDARF VON NITZSCHIA ACTINASTROIDES (LEMM.) V GOOR IN STATISCHER UND HOMOKONTINUIERLICHER KULTUR UNTER PHOSPHATLIMITERUNG), Freiburg Univ. (West Germany). Limnologisches Institut.

For primary bibliographic entry see Field 05C. W73-01445 Institut.

ECOLOGY OF A EUTROPHIC ENVIRON-MENT: MATHEMATICAL ANALYSIS OF DATA, (ECOLOGIE D'UN MILIEU EUTRO-PHIQUE: TRAITEMENT MATHEMATIQUE DES DONNEES). Centre Universitaire de Luminy, Marseille (France). Laboratoire d'Hydrobiologie Marine. For primary bibliographic entry see Field 05C.

W73-01446

LIMNOLOGICAL INVESTIGATIONS OF MOUNTAIN LAKE, GILES COUNTY, VIRGINIA, Virginia Polytechnic Inst., and State Univ., Blacksburg.
For primary bibliographic entry see Field 05C. For primary W73-01447

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FIELD ASSESSMENT OF N2-FIXATION BY LEGUMES AND BLUE-GREEN ALGAE WITH THE ACETYLENE REDUCTION TECHNIQUE, Wisconsin Univ., Madison. For primary bibliographic entry see Field 05C. W73-01456

FOOD AND TROPHIC RELATIONSHIPS OF THE DEVELOPMENTAL STAGES OF MARINE COPEPODS EUCHAETA JAPONICA MARU-KAWA AND CALANUS PLUMCHRUS MARU-KAWA, British Columbia Univ., Vancouver.

A. S. Pandyan.

Available from Univ. Microfilms, Inc., Ann Arbor, Mich., 48106. Ph.D. Thesis, 1971.

Descriptors: "Copepods, "Crustaceans, "Food habits, Diatoms, Phytoplankton, Zooplankton, Growth stages, Food chains, Diets, Distribution patterns, Vertical distribution, Bioassay, Aquatic animals, Chlorophyta, Larvae, Larval growth

plumchrus, Biological samples, Feeding patterns,
Dunaliella tertiolecta, Ditylum brightwelli,
Chaetoceros serpentrionalis, Nauplii,
Copepodites, Copepodids.

Chaetoceros sepentionans, Praspin, Copepodites, Copepodids.

Studies of feeding habits of the life history stages of the marine copepods Euchaeta japonica and Calanus plumchrus suggest that the first two naupliar stages of both species do not feed. Feeding starts with the third nauplius in both species. These and later stages feed readily on heat-killed flagellates, Dunaliella tertiolecta. The fifth and sixth nauplii of Euchaeta japonica and the fourth nauplius of Calanus plumchrus also feed on large diatoms, Ditylum brightwellii and Chaetoceros serpentrionalis, respectively. The sixth nauplius of both species, given a mixture of phytoplankton and zooplankton, feeds selectively on Dunaliella tertiolecta. In Euchaeta japonica, copepodite stages one to six (female) are ominvorous, but food selectivity experiments suggest that copepodite stages one to six (female) are morphologically adapted for a herbivorous. In Calanus plumchrus copepodites one to six (female) are morphologically adapted for a herbivorous diet, but copepodites three to six (female) are also capable of feeding on zooplankton. Copepodite stages three and five prefer zooplankton, whereas the older and younger stages prefer phytoplankton. Temporal variation in feeding is conspicuous in copepodite stages of Calanus plumchrus, and is related to diel vertical distribution and availability of food. Copepodite stages of Euchaeta japonica show less pronounced temporal variation, and their feeding does not seem to be closely related to their vertical distribution. (Mortland-Battelle) W73-01457

QUALITY OF SURFACE WATER OF ESCAM-BIA AND SANTA ROSA COUNTIES, FLORIDA, 1968-72, Geological Survey, Tallahassee, Fln. For primary bibliographic entry see Field 02K. W73-01458

PORE FLUID AND MINERALOGICAL STU-DIES OF RECENT MARINE SEDIMENTS:

BAUER DEPRESSION REGION OF EAST PACIFIC RISE, University of Southern California, Los Angeles. Dept. of Geological Sciences. For primary bibliographic entry see Field 02K. W73-01463

COMPOSITIONAL VARIATIONS OF GASES IN TEMPERATE GLACIERS, Bern Univ. (Switzerland). Physikalisches Institut. For primary bibliographic entry see Field 02C. W73-01490

GUIDE TO USERS OF GROUND WATER IN BAY COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 07C. W73-01502

WINTER SURVIVAL OF FECAL INDICATOR BACTERIA IN A SUBARCTIC ALASKAN RACIERIA
RIVER,
Environmental Protection Agency, College,
Alaska Alaska Water Lab.
For primary bibliographic entry see Field 05B.
W73-01507

WATER QUALITY AT MIAMI INTERNA-TIONAL AIRPORT, MIAMI, FLORIDA, 1971-72, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 05B. W73.01513

GEOCHEMISTRY OF FLUORINE IN WATERS OF CARBONIFEROUS DEPOSITS OF THE MOSCOW ARTESIAN BASIN (GEOKHIMIYA FTORA V VODAKH KARBONA MOSKOV-SKOGO ARTEZIANSKOGO BASSEYNA), For primary bibliographic entry see Field 02K. For primar W73-01523

INORGANIC SULFUR OXIDATION BY IRON-OXIDIZING BACTERIA, Syracuse Univ., N.Y. Dept. of Biology. For primary bibliographic entry see Field 05C. W73-01609

SURVEY OF BENTHIC MACROINVER-TEBRATES AND ANALYSIS OF WATER AND SEDIMENT FROM THE BUFFALO RIVER 1969, State Univ., Coll., Buffalo, N.Y. Great Lakes Lab. A. Sweeney. Special Report No 2, January 1970. 21 p. 1 fig, 10 tab. 9 ref.

Descriptors: "Water pollution control, "Surveys, "Project benefits, Benthic fauna, Invertebrates, Water analysis, Sediments, New York, Lake Eric, Industries, Flow augmentation, Rivers, Water quality, Oligochaetes, Projects, Dredging, Cooling water, Municipal wastes, Lidentifiers: "Buffalo River (N.Y.), Buffalo River Improvement Project.

Quantitative analyses of water, sediment, and macroscopic benthic organisms were made to evaluate the effectiveness of the Buffalo River Imevaluate the effectiveness of the Buffalo River Improvement Project, a cooperative effort between industry and the city, where Buffalo Harbor water is used for industrial cooling and low flow augmentation. Water samples were collected from four stations in the Buffalo River from two meters below the surface at midstream in 1969 and compared with 1968 results. There was a marked decline in conductivity and dissolved solids while suspended solids increased: ammonia and total nitrogen levels were higher. Sediment data differed from those of water. The sediment quality has improved, particularly in respect to oil, chemical and biochemical oxygen demand and chlorine demand. Improvement in benthic environmental quality at the river's mouth was evident by increase in quantity and quality of organisms; snails and immature insects were found in 1969 not observed in 1968. The significant increase in Oligochaeta, just above the up-stream terminus of the Improvement Project also indicated positive chases. However, the worms were not present in the improvement Project also indicated positive change. However, the worms were not present in September. Sections of the river, particularly at the mouth, have improved in quality during the past year. (See also W73-01611) (Jones-Wisconsin) W73-01610

SURVEY OF BENTHIC MACROINVER-TEBRATES AND ANALAYSIS OF WATER AND SEDIMENTS FROM THE BUFFALO RIVER

1970, State Univ., Coll., Buffalo, N.Y. Great Lakes Lab.

A. Sweeney. Special Report No 8, February 1971. 24 p. 11 tab, 15 ref.

Descriptors: "Project post-evaluation, "Water pol-lution control, Benthic fauna, Invertebrates, Water analysis, Sediments, New York, River flow, Projects, Water quality, Pollution abate-ment, Dredging, Biochemical oxygen demand, Municipal wastes, Industrial wastes, Identifiers: "Buffalo River (N.Y.), Buffalo River Improvement Project.

Quantitative analyses of water, sediment, and macroscopic benthic invertebrates of the Buffalo River were conducted for three years aided by grants from the Allied Chemical Corporation. grams from the Allied Chemical Corporation.

Evaluation was made of impact of the Buffalo River Improvement Project and consequences of pollution abatement by those discharging wastes into this stream. The Improvement Project was a cooperative effort involving the City of Buffalo and four industries. While the industries compiled with state and federal pollutions. with state and federal pollution abatement orders by 1970, the municipalities have not implemented reduction in effluent flow to the river from their treatment plants and/or storm sewers to date. The sediment quality has improved markedly over 1969; quantities of total phosphates, organic nitrogen, chlorine, biochemical oxygen demand, and oil have decreased at all stations except one.

Examination of bottom-dwelling macroinvertebrates supported the conclusion that the downstream quality had improved. Recommenda-tions are made for immediate action to speed-up pollution abatement measures by communities discharging into Buffalo River tributaries. Industries are commended for reducing discharges and advised to continue practices to decrease possible detrimental effects of their wastes on water quali-ty, sediment, and aquatic life. (See also W73-01610) (Jones-Wisconsin)

N.M.R. STUDIES OF CHLORINATED POLY-

N.M.R. STODIES OF CHLORINATED POLY-CYCLODIENE PESTICIDES, Environmental Protection Agency, Athens, Ga. Southeast Water Lab.; and National Inst. of En-vironmental Health Sciences, Research Triangle Park, N. C. For primary bibliographic entry see Field 05C. W73-01623

ELECTRONMICROSCOPIC OBSERVATIONS ON THE DEGRADATION OF CELLULOSE FIBRES BY CELLVIBRIO FULVUS AND SPOROCYTOPHAGA MYXOCOCCOIDES, Uppsala Univ. (Sweden). Biokemiaka Institu-For primary bibliographic entry see Field 05B

THE 'ROTARY COLUMN' METHOD FOR GROWTH OF LARGE-SCALE QUANTITIES OF CELL MONOLAYERS.

G. G. Santero.
Biotechnology and Bioengineering, Vol 14, No 5, p 753-775, September 1972. 8 fig. 7 tab, 15 ref.

Descriptors: "Viruses, "Methodology, Cytological studies, Equipment, Temperature, Hydrogen ion concentration, Cultures, Steam, Incubatios, Microscopy.

dentifiers: "Cell monolayers, "Rotary column method, "Culturing techniques, "Growth studies, Sterilization, Trypsinization, Aujeszky disease virus, A2 Hong Kong influenza virus, Rotary columns.

A method and an apparatus that reduce the heavy expenses involved in traditional methods for the large-scale monolayer production of primary and secondary, strain and line cells and of the biologicals derived therefrom are described. The method is based on the principal of gathering in a single unit a sheaf of columns by means of general manifolds fitted with cocks. The growth of cells on the class walls is irrespective of the number. manifolds fitted with cocks. The growth of cells on the glass walls is irrespective of the number, length, and diameter of the columns used. The apparatus, placed in a thermo-adjustable room and connected to adequate devices which allow it to rotate on its longitudinal axis and to be in a vertical position, need not be dismounted nor transported since it can be connected by a number of tubes to the necessary services. Sterilization is carried out by flowing steam and fluids are poured in or drained off by vacuum or pressure. A microscope fitted to the bearing structure allows the operator to observe the cell monolavers and the cytopathic fitted to the bearing structure allows the operator to observe the cell monolayers and the cytopathic effect of viruses on the whole length of the outer columns. During the various working stages pH is under continuous control and automatically adjusted. The whole working cycle is extensively described (cleaning, sterilization, seeding, incubation, trypsinization of the monolayer, culture and harvesting of the virus) and results compared with those obtained by traditional methods. (Byrd-Battelle) telle) W73-01660

THE NUTRITION OF BACILLUS MEGATERI-UM AND BACILLUS CEREUS, Sheffield Univ. (England). Dept. of Microbiology. For primary bibliographic entry see Field 05C. W73-01662

DELTA COD GETS NOD OVER BOD TEST. Oklahoma State Univ., Stillwater. A. F. Gaudy, Jr., and E. T. Gaudy. Industrial Water Engineering, Vol 9, No 5, p 30-38, August/September 1972.

Descriptors: *Chemical oxygen demand, *Biochemical oxygan demand, Organic matter, Biological treatment, Activated sludge, Aerobic conditions, Pollutant identification, Aerobic treatment, Water purification, Microbial degradation, Water pollution sources, Sewage effluents, Metabolism.

Identifiers: Substrate removal, Substrate utilization

Delta COD represents the most straightforward measurement of the amount of organic matter available in a biological treatment facility. The BOD test estimates what delta COD actually mea-BOD test estimates what delta COD actually measures. Moreover, since ultimate BOD can only approach delta COD as an upper iimit, the latter parameter gives a more conservative estimate of the ultimate biochemical oxygen demand of a waste sample. The determination of delta COD is a measurement of only that portion of the COD of the waste which is available as biological substrate for acclimated microorganisms (or which may be otherwise removed due to the presence of the biomass, e.g., the small amount of colloidal COD which could be adsorbed on the cell surfaces). The

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residual COD, if sufficient seration time has been allowed, is composed of material not utilizable by a microbial population. Thus one can employ delta COD to assess the amount of biochemical oxygen-demanding organic matter present, regardless of the presence of some non-biodegradable COD in the waste. The use of delta COD as the primary operational parameter in biological treatment should do much to enhance intelligent and careful daily control of the process, since information on plant efficiency is available immediately rather than 5 days later as it would be if BOD sub 5 is used. The COD test run on the effluent does not distinguish between metabolizable and non-metabolizable organic matter remaining in the effuent, and it is therefore absolutely necessary that frequent checks on the metabolizable organic content of the effluent be made. (Byrd-Battelle)

EQUILIBRIUM AND KINETIC SIMULTANE-OUS DETERMINATION OF SUL-FONEPHTHALEIN DYE MIXTURES BY THE METHOD OF PROPORTIONAL EQUATIONS, Oklahoma State Univ., Stillwater. Dept. of Chemistry. G. L. Ellis, and H. A. Mottola. Analytical Chemistry, Vol 44, No 12, p 2037-2043, October 1972. 1 fig, 6 tab, 20 ref.

Descriptors: *Dyes, *Water analysis, *Spectrophotometry, *Absorption, Phenols, Organic

trophotometry, "Absorption, Phenots, Organic compounds.
Identifiers: "Sample preparation, "Cresols, Absorbance, Bromothymol blue, Cresol rod, Cresol parple, Glycinecresol red, Glycinethymol blue, Phenol red, Thymol blue, Xylenol blue, Bromocresol purple, Bromocresol green, Promophenol blue, Chlorophenol red.

Equilibrium and kinetic absorptiometric methods based on proportional equations have been developed and compared for the determination of binary and ternary mixtures of sulfonephthalein dyes. The kinetic determinations are based on the rather selective oxidation of sulfonephthalein dyes by periodate ion in basic medium (pH 7 to 10) catalyzed by manganese (II) and the difference in rate of oxidation exhibited by the individual dyes. A selective determination of Cresol Red is also included. The kinetic determinations compare well with the equilibrium determinations and show an advantage in the case of an unreactive absorbing background. (Little-Battelle)

SPECTROELECTROCHEMICAL STUDIES OF SPECTRORLECTROCHEMICAL STUDIES OF METAL DEPOSITION AND STRIPPING AND OF SPECIFIC ADSORPTION ON MERCURY-FLATINUM OPTICALLY TRANSPARENT ELECTRODES, Ohio State Univ., Columbus. Dept. of Chemistry. W. R. Heineman, and T. Kuwana. Analytical Chemistry, Vol 44, No 12, p 1972-1978, October 1972. 4 fig, 1 tab, 18 ref.

Descriptors: *Adsorption, *Mercury, *Electrodes, Optical properties, Ions, Lead, Cadmium, Zinc, Pollutants, Pollutant identification, Elec-

Politicants, Folurist Identification, Electrochemistry, Identifiers: *Deposition (Metals), *Stripping (Metals), *Spectroelectrochemical characteristics, *Platinum, Spectroelectrochemistry, Molar absorptivity, Thallium.

Optical and electrochemical characteristics of the mercury-platinum optically transparent electrode (Hg-Pt OTE), as applied to the deposition of a metal into the thin mercury film, are evaluated. Substantial mercury character can be achieved with film thicknesses of as little as 10 mC mercury/aq cm (ca. 150 A), as evidenced by the stripping behavior for lead. The use of the Hg-Pt OTE for the evaluation of molar absorptivities of metals dissolved in mercury and the detection of ionic

surface excess at the electrode-solution interface is described. Light passing through the Hg-Pt OTE during the diffusion controlled reduction of metal ions is attenuated by the accumulation of electrodeposited metal in the thin mercury film. The rate of this attenuation is related to the molar absorptivity of the metal is mercury. Molar absorptivities for Pb, Cd, Tl, and Zn which were determined in this manner are compared with reported values for the bulk metal. The existence of a surface excess of a metal ion can be detected by a perturbation on the transmission absorbance-time curve. This is quantitatively demonstrated for lead tetrabromide. A step change in the applied potential was also found to produce an optical perturbation which is attributed to the attendant change in the surface concentration of non-electroactive ionic species such as aitrate and bromide. Signal averaging was necessary to resolve the small optical responses involved. Use of the Hg-Pt OTE for stripping analysis is considered. (Byrd-Battelle) W73-01666

THE NECESSITY OF CONTROLLING BACTERIAL POPULATIONS IN POTABLE WATERS: COMMUNITY WATER SUPPLY, Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab. For primary bibliographic entry see Field 05F. W73-01667

SCATTERING LAYERS AND VERTICAL DIS-TRIBUTION OF OCEANIC ANIMALS OFF OREGON,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 05C.
W73-01671

ECOLOGICAL OBSERVATIONS ON THE BENTHIC INVERTEBRATES FROM THE CEN-TRAL OREGON CONTINENTAL SHELF, Oregon State Univ., Corvallis. Dept. of Oceanog-

raphy.
A.G. Carey, Jr.
A.G. Carey, Jr.
Available from the National Technical Information Service as RLO-1750-57, \$3.00 in paper copy,
8.95 in microfiche. Report No RLO-1750-57,
1970. 33 p, 10 fig, 5 tab, 7 ref. Grant Nos GB-531,
GB-4629. Contract No AEC AT (45-1)-1750, AT

Descriptors: *Bcology, *Invertebrates, *Oregon, *Continental shelf, *Ecological distribution, *Benthic fauna, Mollusks, Nematodes, Deepwater habitats, Distribution patterns, Crustacens, Biomass, Sea water, Copepods, Water pollution sources, Annelids, Sediments, Sampling, Shrimp, Gastropods. Identifiers: Infauna, Echinoderms, Arthropods, Polychaetes, Macroinvertebrates, Epifauna, Allocentrotus fragilis, Aphrodite japonica.

The distribution and abundance of benthic invertebrates have been characterized on the continental shelf west of Newport, Oregon by standard techniques. The infauna was collected by deep-sea anchor dredge and anchor-box dredge from a transect of five stations across the shelf, and the macro-epifauna by quantitative three meter beam trawl from four stations. The composition and abundance of the fauna changes with increasing depth and distance from shore. The macro-epifauna is comprised of a sparse molluskan assemblage inshore while at the shelf edge it consists of pulsary of the state of the shelf edge it consists of pulsary. depth and distance from shore. The macro-epifau-ma is comprised of a sparse molluskan assemblage inshore, while at the shelf edge it consists of nu-merous echinoderms and crustacea. The infaunal composition exhibits a seaward trend, changing from a searshore filter-feeding arthropod assem-blage to a burrowing polychaete dominated one. Abundance increases seaward with the largest nu-merical density and biomass supported at the 200 m depth at the shelf edge. Polychaete worms were demonstrated to form closely associated species groups at the inner, middle, and outer portions of the continental shelf. These faunal trends can be correlated with various aspects of the benthic environment that are changing with increasing depth and distance from shore. Sediment may play a major role in determining the distribution and abundance of fauna; it is, however, but one of an interacting complex of environmental features that affect the fauna. (Byrd-Battelle) W73-01672

PRELIMINARY RADIATION SURVEILLANCE OF AN AQUATIC SYSTEM NEAR THE NEVADA SITE, JUNE, 1967, Environmental Protection Agency, Las Vegas, Nev. Western Environmental Research Lab. W. L. Klein, and R. A. Brechbill.

W. L. Klein, and R. A. Brechbill.
Available from the National Technical Information Service as SWRHL-65-r, \$3.00 in paper copy,
\$0.95 in microfiche. Report No SWRHL-65r,
February 1972, 23 p. 2 fig, 3 tab, 10 ref, 2 append.
Memorandum of Understanding No SF 54 373.

Descriptors: *Surveys, *Aquatic environment, *Radioceology, *Radiochemical analysis, Measurement, *Nevada, Aquatic plants, Water pollution sources, Sediments, Aquatic soils, Flant tissues, Freshwater fish, Aquatic algae, Evaluation, Sampling, Carp, Potassium radioisotopes, Strontium radioisotopes, Soil analysis, Soil contamination, Cladophora, Chara, Fish eggs. Identifiers: *Biological samples, Sr-90, K-40, Cs-137, *Pahranagat Lake, Gamma ray spectrometry, Animal tissues, Macrophytes, Cyprinus carpio, Mosquito fish, Gambusia affinis, Cesium radioisotopes, Cladophora spp, Paspalum distichum, Potamogeton pectinatus, Eleocharis montevidenses, Chara asppra, Scirpus spp, Gills, Muscle, Viscera, Eyes, Scales (Fish), Bone.

A three-month preliminary radiation surveillance study was made of an aquatic system in Upper Pahranagat Lake near the Nevada Test Site. The objectives were to determine the concentrations of fission products in selected samples and to establish the necessary methodology for radiation surveillance in an aquatic ecosystem. Biological samples from a freshwater lake near the Nevada Test Site (NTS) were analyzed for the presence of selected radionuclides in order to establish a base line for this particular system and to develop methodology necessary for any further definitive studies of this type. Radionuclide concentrations were insignificant in water, aquatic plant, and fish samples. Sediment samples had detectable levels of Cs-137, K-40, Sr-90, and U. Strontium-90 levels in fishbone were low (2.38 pCi/g bone ash) compared to those found in bovine femur samples (6.9 pCi/g bone ash) collected during the same period. (Mackan-Battelle) A three-month preliminary radiation surveillance W73-01673

DETERMINATION ON MERCURY IN SAM-PLES FROM THE DUTCH ENVIRONMENT, Interuniversitair Reactor Instituut, Delft (Nether-

J. J. M. De Goeij. Available from the National Technical Informa-tion Service as N72-21111, 83.00 in paper copy, 80.95 in microfiche. Report No IRI-133-71-17, 1971. 21 p, 12 fig, 1 tab, 10 ref.

Descriptors: "Mercury, "Neutron activation analysis, Chemical analysis, "Industrial wastes, "Pollutant identification, Water pollution sources, Heavy metals, Separation techniques, Irradiation, Sediments, Cattle, Birds, Foods, Plants, Marine fish, Toxicity, Milk, Water analysis, Marine animals, Salmon, Herrings, Commercial fish, Automatica

tomation.

Identifiers: *Biological samples, *Methyl mercury, *Rhine River, Seals (Animals), Tuna,
Mackerel, Pilchard, Cod, Haddock, Liver, Brain,
*Netherlands, Body fluids, Environmental samples.

Samples of sediments; biological tissues and fluids (birds, fishes, and man); human hair; foodstuffs; industrial products and pharmaceuticals; and plants and water were analyzed for mercury by neutron activation analysis. These samples, ranging from 100 mg-l/g, were irradiated in quartz vials, automatically decomposed and oxidized by sulfurir acid and hydrogen peroxide, and volatized at 200C with HBr into a sodium acetate solution. Inactive mercury was added to the solution and stirred for 1 hr to break the mercury into small droplets to ensure isotopic exchange. The Hg was then collected on a sintered glass filter, washed with water then acetone, and finally dissolved in nitric acid and counted in a well type sodium iodide crystal. A sensitivity and an accuracy of 1.0-0.1 ppb/gram sample and 97-98 percent yield were achieved, respectively. Results showed that (1) one quarter of the birds tested had been killed by methylmercury; (2) in the food chain: sediments-grass-cow - milk, cumulative effects were absent; (3) Rhine River sediments showed increases of 18-23 ppm compared to previous tests; and (4) while Dutch fish, seals and coastal marine organisms were generally contaminated, imported canned fish and cod liver oil were in low ranges. Separate measurements showed not only that tuna had higher concentrations but that about 80 percent of the mercury in all fish was present as lipophilic methylmercury. (Mackan-Battelle)

A TAXONOMIC STUDY OF SOME CORYNEFORM BACTERIA, TOTRY Research Station, Aberdeen (Scotland). L.J. Bousfield.

Journal of General Microbiology, Vol 71, No 3, p 441-455, August 1972. 3 tab, 56 ref.

Descriptors: "Systematics, "Speciation, Sewage bacteria, Computers, Mathematical studies, Soil contamination, Numerical analysis, Marine bacteria, Cultures, Activated sludge, Vegetation. Identifiers: "Coryneform bacteria, "Numerical taxonomy, Nucleic acids, DNA, Guanime, Cytosine, Biochemical tests, Organic bases, Corynebacterium spp, Arthrobacter spp, Brevibacterium spp, Mycobacterium spp, Nocardia calcarea, Nocardia cellulans, Nocardia canicruria, Cellulomonas biazotea, Cellulomonas fimi, Listeria monocytogenes, Brysipelothrix rhuisopathiae, Flavobacterium spp, Corynebacterium diphtheriae intermedius, Corynebacterium diphtheriae gravis.

diphtheriae gravis.

Some 100 features (biochemical tests, microscopic and cultural characteristics, and DNA base composition) have been used as a basis for the numerical, computer-assisted analysis of 158 coryneform bacteria in order to determine their suitability of fit in their present taxonomic divisions. The general conclusions include the following: (1) The genus Corynebacterium and the taxonomy of Brevibacterium are not satisfactory. (2) Several organisms previously classified as flavobacteria seem better placed in the coryneform group. (3) Certain non-cellulolytic strains could more properly be placed in the genus Cellulomonas, e.g., Nocardia cellulans. (4) The boundary between Nocardia and Arthrobacter is ill-defined and several organisms of the Mycobacterium rhodochrous type seem transitional. (5) The taxonomy of the genus Microbacterium is shown as unsatisfactory but a solution has not been provided. (Mackan-Battelle) W73-01675

SURVEY OF TECHNIQUES USED TO PRESERVE BIOLOGICAL MATERIALS, Stanford Research Institute, Menlo Park, Calif. E. J. Feinler, and R. W. Hubbard. Available from the National Technical Information Service as N72-18080, 56.00 in paper copy, 30.95 in microfiche. NASA Contract Report No. 114422, January 1972. 390 p, 78 tab, 1350 ref. Project No. SRI LSU-8930. Contract No. NAS2-6201.

Descriptors: "Surveys, "Methodology, Freeze drying, Refrigeration, Incubation, Dialysis, Chemicals, Drying, Freezing, Radiation, Cytologi-cal studies, Plant tissues, Algae, Microorganisms, Bacteria, Invertebrates, Fungi, Enzymes, Animal parasites, Viruses, Mollusks, Protozoa, Yeasts, Insects, Mildews, E. coli, Fish, Foods, Grasses,

Insects, Mildews, E. coli, Fish, Foods, Grasses, Worms.
Identifiers: *Biological materials, *Biological samples, *Sample preservation, Chemical preservation, Histochemistry, Lyophilization, Animal tissues, Histological studies, Body fluids, Vertebrates, Heat sterilization, Fixation, Embedding, Ashing, Bone, Organs, Brain, Blood, Kidneys, Liver, Plasmodium berghei, Borrelia kansas, Borrelia anserium.

Existing techniques used to preserve biological materials are described. This information is presented in a handbook format that categorizes the most important preservation techniques available, and includes a representative sampling of thousands of applications of those techniques to biological materials and organisms. The handbook is divided into four main sections: (1) a review of reviews, (2) tables of techniques of preservation, (3) indexes, and (4) a comprehensive bibliography. (Holoman-Battelle)

SURFACE ZOOPLANKTON FROM AUKE BAY AND VICINITY, SOUTHEASTERN ALASKA, AUGUST 1962 TO JANUARY 1964, National Marine Fisheries Service, Auke Bay, Alaska, Auke Bay Fisheries Lab.

B.L. Wing, and G. M. Reid.
Available from the National Technical Information Service as COM-72-10447, \$9.00 in paper copy, \$0.95 in microfiche. Report No. NOAA-NMFS-DR-72, March 1972. 765 p, 2 fig, 8 tab, 29 ref. COM-72-10447.

ref. COM-72-10447.

Descriptors: "Zooplankton, "Systematics, Alaska, "Surveya, "Estuaries, Sampling, Phytoplankton, Primary productivity, Sea water, Invertebrates, Cycling nutrients, Plankton nets, Protozoa, Larvae, Rotifers, Nematodes, Mollusks, Annelids, Insect eggs, Fish eggs, Density stratification, Salinity, Water temperature, Nitrates, Phosphates, Silicates, Biochemical oxygen demand, Chemical oxygen dema

Mysis (Larvae), Finter, Osmendae, Barnacies.

A detailed study was conducted of zooplankton of an inshore area of southeastern Alaska. The purpose was to (1) make a species checklist and (2) determine seasonal patterns of occurrence and abundance of planktonic animals in the surface waters (0-20 m) of the area. The data presented include both qualitative and quantitative information on collections made from August 1962 - August 1964 in and near Auke Bay (an estuary). A list of species, counts of each species per cubic meter, and the volume of zooplankton per 1000 cubic meter, and the volume of zooplankton per 1000 cubic meters from the surface waters of Auke Bay and vicinity are included. Descriptions are also given of meteorology (seasonal rainfall, air temperature, wind patterns), oceanography (density startification, density currents), and cycles of phytoplankton productivity as related to cyclic nutrient concentrations (nitrates, phosphates, silicates). A table for converting from counts to volume, wet weight, and dry weight for selected species has been abstracted from the literature. (Holoman-Battelle) W73-01677

HEAVY METALS-AN INVENTORY OF EXIST-ING CONDITIONS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 05B.
W73-01731

RADIUM-226 IN ENVIRONMENTAL MATERI-ALS AND FOODS, European Atomic Energy Community, Ispra (Ita-ly). Joint Nuclear Research Center. M. DeBortoli, and P. Gaglione. Health Phys. Vol 22, No 1, p 43-48, 1972. Illus. Identifiers: Emanation technique, Environmental materials, Foods, "Ispra (Italy), "Radium-226, Monitoring, "Radionuclides.

In the frame of the site radiation monitoring program at the Euratom Research Establishment at Ispra, Italy, the natural levels of 226Ra in some environmental materials and in the population diet were studied. Determinations of the radiomuclide were carried out by the emanation technique on samples of vegetation, milk, animal bones, lake waters, fishes and foods, in an attempt to estimate 226Ra intake by the population living in the area. Information was sought about the transfer of Ra through the different environmental chains, and its behavior when compared with that of Ca. The mean 226Ra concentration in the soil is 0.72 Ci/g, and the estimated daily intake by a person consuming foods of local origin is 1.4 pCi of 226 Ra, or 2.8 pCi/g Ca.—Copyright 1972, Biological Abstracts, Inc.

PUB AND OTHER INDUSTRIAL HALOGENATED HYDROCARBONS IN THE Fighbories P. ENVIRONMENT, Fisheries Research Board of Canada, St. Andrews (New Brunswick). For primary bibliographic entry see Field 05B. W73-01897

5B. Sources of Pollution

AN EXAMINATION OF APPLICATIONS OF REMOTE SENSING DATA TO METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS' PLANNING REQUIRE-MENTS, Metropolitan Washington Council of Govern-ments, D. C. For primary bibliographic entry see Field 03E. W73-01299

A MATHEMATICAL MODEL PREDICTING TIDAL CURRENT VELOCITIES IN THE STRAIT OF GEORGIA-JUAN DE FUCA STRAIT SYSTEM, Victoria Univ. (British Columbia). Dept of Physics.
J. M. Dewey, and D. J. McMillin.
Canadian Journal of Earth Sciences, Vol 9, No 10, p 1325-1332, October 1972. 5 fig. 5 ref.

Descriptors: *Tides, *Currents (Water), *Mathematical models, *Path of pollutants, *Washington, Tidal waters, Water level fluctuations, Water circulation, Inlets (Waterways).
Identifiers: Strait of Juan de Fuca (Wash).

A one-dimensional model was developed for cal-culating the time variation of tidal current veloci-ties throughout the Strait of Georgia and Juan de Fuca Strait system. The calculated velocity field is input to a particle transport model predicting the motion of foreign material released in the tidal stream. The velocity calculations are based on the detailed channel dimensions and on observed tidal heights at a number of stations in the system. Only the hydrodynamic equation of continuity is used, which avoids the necessity of using arbitrarily ad-justed roughness coefficients. As a single bounda-

Group 5B-Sources of Pollution

ry condition it is assumed that there is a constant zero velocity at the head of the channel, where the volume flow rate is small compared to other parts of the system. The calculated velocity field com-pares well with the limited number of observations that have been made. (Knapp-USGS) W73-01501

HYDRAULIC TESTS IN HOLE UAE-6H, AMCHITKA ISLAND, ALASKA, Geological Survey, Lakewood, Colo. For primary bibliographic entry see Field 08B. W73-01303

GROUND-WATER FOLLUTION IN THE VICINITY OF TOLEDO BEND RESERVOIR, TEXAS, PROGRESS REPORT, 1972, Geological Survey, Austin, Tex. E. T. Baker, Jr., and J. Rawson. Geological Survey Open-file Report, August 1972. 24 p, 1 fig, 4 tab, 6 ref.

Descriptors: "Groundwater movement, "Water levels, "Water pollution sources, "Water quality, "Texas, Reservoirs, Land development, Recrea-tion, Water wells, Septic tanks, Coliforms, Chemi-cal analysis, Sampling, Test wells, Well data, Data identifiers: *Toledo Bend Reservoir area (Tex).

Groundwater quality and water-level data are presented for the Toledo Bend Reservoir area in Texas. Toledo Bend Reservoir on the Sabine River in eastern Fexas and western Louisiana is a multipurpose project designed to generate power and conserve water for municipal supply, industrial use, and irrigation. Boating, fishing, camping, and other water-related recreational activities in the area have undergone phenomenal growth since impress have undergone phenomenal growth since imother water-related recreational activities in the area have undergone phenomenal growth since impoundment of water in the reservoir began in October 1966. Test wells were installed down the land-surface alope from the septic-tank systems, between the septic tanks and the reservoir. Because the elevation of the water table is higher than the water-surface elevation in Toledo Bend Reservoir, most of the shallow groundwater moves toward the reservoir. In the spring of 1972, coliform density of shallow groundwater samples ranged from zero in seven wells during Mary to the shallow and two wells during May to 18,000 colonies per 100 ml in a McGe's Landing well during May. At least one sample from 18 of the 20 test wells contained coliforms, and at least one sample from 12 wells contained more than 1,000 coliform colonies per 100 ml. (Woodard-USGS)

GROUNDWATER **DEGRADATION-CAUSES** AND CURES, Geological Survey, Washington, D.C.

L. A. Wood. L. A. Wood.
Proceedings available from Engineering Pub. Office, Ill. Univ., 112 Engineering Hall, Urbana 61801; Price 36.50. In: Proceedings of 14th Water Quality Conference on Groundwater Quality and Treatment, February 9-10, 1972, Illinois University Department of Civil Engineering, Urbana: University of Illinois Bulletin, Vol 69, No 120, p 19-25, May 26, 1972. 28 ref.

Descriptors: *Water pollution sources, *Ground-water, Waste disposal wells, Injection wells, Landfills, Infiltration, Groundwater movement, Monitoring, Water pollution control. Identifiers: *Groundwater pollution.

About 20% of the water used in the United States for domestic, municipal, industrial, and irrigation purposes is groundwater. Its availability at the point of need makes groundwater an extremely valuable natural resource. However, all groundwater is no longer pure and uncontaminated because the activities of man have degraded some of it. Methods or causes of groundwater degrada-

tion are (1) waste-disposal activities, (2) accidental spills, (3) improper well construction, and (4) unintentional byproducts of activities other than waste disposal. The emphasis on cleaning up the nation's surface waters through the Federal Water Quality Act and the numerous incidents of shallow groundwater pollution have led to a new industry-deep well injection. Since 1950, nearly 200 industrial waste injection wells have been drilled in the United States. The time required to flush pollution from an aquifer will range from a comparatively abort period to periods measured in geologic time. Monitoring waste movement in aquifers will not prevent pollution, but will show where it is or is not. The most satisfactory cure for groundwater pollution is prevention. (Knapp-USGS)

THE ACCUMULATION AND SIGNIFICANCE OF SLUDGE NEAR SAN DIEGO OUTFALI Water Resources Engineers, Inc., Walnut

Calif. Chen, and G. T. Orlob. Journal Water Pollution Control Federation, Vol 44, No 7, p 1362-1371, July 1972. 7 fig. 6 tab, 7 ref.

Descriptors: *Sludge, *Waste water disposal, *Mathematical modeling, *Biochemical oxygen demand, Biological communities, Benthic fauna, Sedimentation rates, *California, *Outlets, Path of pollutants.

politizants.
Identifiers: *Biological reaction, *Benthic popula-tion reactions, Organic particulates, *San Diego (Calif).

Sludge deposition patterns depend on initial mixing, lateral dispersion, sedimentation rates, and decay of organics. In the design of this outfall, an eliptical deposition pattern located far enough from shore to prevent harm to bathers was predicted. Observation supported the prediction. Monitoring the shudge buildup consisted of sampling for BOD, COD, nitrogen content, sand and silt composition, and temperature. BOD samples proved to be the most sensitive indicator of environmental response to the discharge. Above a tolerance level of 3 mg/g BOD increase in the sediment, adverse reactions were noticed in the benthic community. Population and distribution remained reasonably stable, predominant species changed population ratios but still remained predominant. Maximum biostimulation occurred about 1.5 miles from the outfall. (Anderson-Texas) W73-01344

PER CAPITA LOADINGS OF DOMESTIC WASTEWATER, Marquette Univ., Milwaukee, Wis. Dept. of Civil

Engineering.
A. E. Zanoni, and R. J. Rutkowski.
Journal Water Pollution Control Federation, Vol
44, No 9, p 1756-1762, September 1972. 9 tab, 12

Descriptors: *Domestic sewage, Waste water treatment, *Biochemical oxygen demand, *Chemical oxygen demand, Nitrogen, Phosphorous, *Suspended solids, Nutrients, Domestic wastes. Identifiers: *Loading values.

The early value of 0.17 lb BOD/cap/day for domestic waste water has been used unchallenged for years. In order to re-establish this value, the sewage from a modern middle class neighborhood was investigated. Characterizing the system included studying sewer as-built records and mailing questionnaires to residents. Sampling consisted of collecting tweaty-four and twelve hour composites and analyzing for SS, BOD, and COD. The effects of a thirty percent home garbage grinder use was investigated as well as other ancillary factors. The final value of 0.10 lb BOD/cap/day is low compared to the accepted value. The per capita nutrient loadings determined in a related study are also presented. These values have significance in

establishing the population equivalent of industrial wastes in cost apportionment formulas. (Ander-

PONTOPOREIA AFFINIS (CRUSTACEA, AM-PHIPODA) AS A MONITOR OF RADIOACTIVI-TY IN LAKE MICHIGAN, Michigan Univ., Ann Arbor. C. C. Kidd.

Available from University Microfilms, Ann Ar-bor, Michigan, Order No. 71-15-197. Ph. D. Disser-tation, 1970. 81 p.

Descriptors: *Chemical analysis, *Radioisotopes, *Zinc, *Manganese, *Strontium, Indicators, Radioactive wastes, Nuclear power plants, *Lake Michigan, Crustacea, Amphipoda.
Identifiers: *Pontoporeia affinis, Leuciscus

This investigation involved evaluating the Pon-toporeia affinis, a benthic amphipod native to Lake Michigan, as a monitor of radionuclide found in radioactive wastes. The Pontoporeia affinis were found to be well distributed in almost all areas of the Lake Michigan benthic community. P. affinis accumulated radioactive strontium, mag-nesium and zinc when exposed to dilute solutions of radioactive wastes from nuclear facilities. Atomic absorption spectrophotometry of whole P. affinis and lake water revealed the naturally occurring concentration factors (based on wet weight) for strontium, manganese and zinc were 260, 5,846, and 3,540 respectively. Repeated exposure of P. affinis to low concentrations of manganese-54 and zinc -84 indicated quasi-equilibrium con-centrations were established in 10 days. Similar centrations were established in 10 days. Similar exposure to strontium -85 approached equilibrium values in 23 days. Temperature and pH variations did not significantly influence accumulation of radionuclides in P. affinis when within the limits normally encountered in the environment. Presence of strontium -85, manganese -34 and zinc -65 in P. affinis was prolonged by the presence of radioactive sediment. However, sterilization of natural sediments significantly reduced accumulation of manganese -54 and zinc -65. The P. affinis was found to be a suitable monitor for manganese -54 and zinc -65. (Albert-Texas)

DYNAMICS OF NITRATES IN IRRIGATED CALCAREOUS CHERNOZEM (IN RUSSIAN).

Tr Kuban S-Kh Inst. Vol 20, No 48, p 27-37. 1970. Identifiers: *Irrigation effects, Fertilization, Chernozem, Corn, Dynamics, *Leaching, Nitrates,

Irrigation with 1200 m3/ha caused the nitrate Irrigation with 1200 m3/ha caused the nitrates from fertilizers in soil to migrate to a depth of 30-75 cm in the first day. The largest content of nitrates in the 0-20 cm soil layer was produced by manuring with (NH4)2SO4, and in the layer 30-75 cm after NH4NO3 and NaNO3 application. Irrigation with 2500 m3/ha eluviated the nitrates from all fertilizers almost completely from the 0.5-m layer, and they were detected in the filtration waters. When the fall weather was warm ammonium N was converted to nitrate N in 1 mo. Irrigation reduced the content of nitrates in the arable layer was converted to intrate in the arable layer by 1/3 to 1/2, but in a warm fall their content was even greater than without irrigation, I mo. later. Spring irrigations also reduced the content of nitrate N. Vegetative irrigations were followed by the migration of nitrates to deeper soil layers. NPK increased the content of nitrates by 15-20% in dry farming and by 10-14% under irrigation.—Copyright 1972, Biological Abstracts, Inc. I. PATTY ACID SYNTHESIS IN PSEU-DOMONAS FLUORESCENS. II. LIPID DEFI-CIENT MUTANTS OF ESCHERICHIA COLI, Harvard Univ., Cambridge, Maşs. For primary bibliographic entry see Field 05C. W73-01430

THE ORGANIC GEOCHEMISTRY OF HYDROCARBONS IN COASTAL ENVIRON-MENTS. MENTS, Texas Univ., Austin.

J. R. Sever. Available from Univ. Microfilms, Inc., Ann Arbor, Mich., 48106 Order No. 72-2418. Ph. D. Thesis, 1970. p 155.

Descriptors: "Coasts, "Organic compounds, "Geochemistry, Cyanophyta, Bacteria, Algae, Plankton, Plants, Spectroscopy, Chromatography, Gas chromatography, Identifiers: Nostoc muscorum, Lyngbya lagerhaimii, 7-methylheptadecane, 8-methylheptadecane, Hydrocarbons, Alkanes, Aliphatic hydrocarbons, Mass spectrometry, Infrared spectroscopy.

Since hydrocarbons in the marine environment are relatively biologically and chemically inert, a study was conducted to determine if a precursor relationship could be observed between hydrocarbons in the sediments and hydrocarbons in the dominant organisms which contribute organic matter to the sediments. By examining the hydrocarbon distributions of the organisms and environments of these coastal areas, an onen shallhydrocarbon distributions of the organisms and environments of three coastal areas - an open shallow bay, an intertidal blue-green algal lagoon, and a supratidal lagoon, - it was possible to observe direct correlations between the biological and geological alkanes. Identification of the hydrocarbons was done by infrared spectroscopy, mass spectrometry, and gas-liquid chromatography. Five cultured blue-green algae showed a narrow distribution of normal alkanes with chain lengths between C15 and C19 with C17 predominating. Bacterial alkane distributions were of two types: Between C13 and C19 with C17 precommaning. Bacterial alkane distributions were of two types: C14 - C18 range and branched hydrocarbons in the range of C15 - C20. Analysis of seven dominant higher marine plants revealed a distinct odd-carbon number distribution in the C25 - C31 range, bon number distribution in the C25 - C31 range, while a plankton tow yielded an unbiased smooth distribution over the C14 - C28 range. Analysis of eight ancient shales showed the unique 50:50 alkane mixture of 7-methyl and 8-methyl heptadecane with the majority of samples displaying the C17 alkane as one of the largest hydrocarbon components. This suggests large deposits of blue green algae at the time of deposition. (Mackan-Battelle) W73-01439

A FEASIBILITY STUDY OF A LABORATORY MODEL AS A RESEARCH TOOL FOR IM-POUNDMENT WATER QUALITY INVESTIGA-

TIONS, Oklahoma Univ., Norman. J. W. Keeley. Available from Univ. Microfilms, Inc., Ann Arbor, Mich., 48106 Order No. 72-3406. Ph. D. Thesis, 1971. p 130.

Descriptors: "Water quality, "Impoundment, "Model studies, "Physiochemical properties, Ecosystems, Watersheds, Rainfall, Runoff, Aquaria, Percolation, Water analysis, Aeration, Light intensity, Evaporation, Sediment-water interfaces, Nutrients, Plankton, Phytoplankton, Cooplankton, Hydrogen ion concentration, Alkalinity, Dissolved solids, Calcium, Magnesium, Hardness (Water), Color, Bacteria, Biochemical oxygen demand.
Identifiers: Orthophosphates.

This laboratory and field study was designed to evaluate the feasibility of a laboratory model (simulated ecosystem) as a research tool for water

quality investigations. The objectives were to provide the engineer additional techniques for preimpoundant site selection, and the aquatic scientist with additional means for studying the behavior of water in an impoundment. A percolation column filled with topsoil from the watershed of a selected impoundment and fed periodically with aerated, distilled water was used to simulate the water quality of watershed-rainfall-runoff in the area. Efficient from the column was used to simulate the quality of watershed-rainfall-runoff in the area. Effluent from the column was used to simulate the impoundment under study. Routine water quality analyses were conducted periodically on the column effluent and the aquarium for approximately 400 days. In addition, responses of the laboratory model to alteration of various environmental control factors such as aeration, evaporamental control factors such as aeration, evapora-tion, light, and increased concentration of biodegradable materials were determined. Brief biodegradable materiais were determined. Brief studies were also conducted on the sediment-water interaction in the model. All such findings were compared to the selected impoundment used in the field studies. Results indicated that the per-colation column supplied a continuous source of nutrients and other constituents to the aquarium. nutrients and other constituents to the aquarium. The chemical water quality of the model became surprisingly similar to that of the impoundment under study. There was an increase in pH, alkalinity, TDS, calcium and magnesium hardness and a decrease in color, bacteria, turbidity, BOD, and dissolved orthophosphate. (Mortland-Battelle) W73-01442

ANNUAL ENERGY BUDGET OF A SMALL FOREST STREAM ECOSYSTEM: BEAR BROOK, WEST THORNTON, NEW

BROOK, WEST THORNTON, N HAMPSHIRE, Dartmouth Coll., Hanover, N.H. For primary bibliographic entry see Field 05C. W73-01448

THE SPECIES COMPOSITION, SEASONAL SUCCESSION, REPRODUCTION AND DISTRIBUTION OF MARINE ALGAE FROM SCITUATE TO WOODS HOLE, MASSACHUSETTS, New Hampshire Univ., Durham. For primary bibliographic entry see Field 05C. W73-01449

THE ACCUMULATION OF FREE FATTY ACIDS FROM SEA WATER BY MARINE IN-VERTEBRATES, California Univ., Irvine. For primary bibliographic entry see Field 05C. W73-01451

THE INTERRELATIONSHIPS AMONG PLANK-TON, ATTACHED ALGAE AND THE PHOSPHORUS CYCLE IN ARTIFICIAL OPEN

Toronto Univ. (Ontario). For primary bibliographic entry see Field 05C. W73-01454

TRACE ELEMENTS IN BOTTOM SEDIMENTS FROM UPPER PEORIA LAKE, MIDDLE IL-LINOIS RIVER—A PILOT PROJECT, Illinois State Geological Survey, Urbana. C. Collinson, and N. F. Shimp. Illinois Geological Survey Environmental Geology Notes, No 56, September 1972. 21 p, 5 fig, 7 tab, 27 ref.

Descriptors: *Trace elements, *Bottom sedi-Descriptors: "Face cements, "Journal security," Lakes, "Path of pollutants, "Illinois, Sampling, Chemical analysis, Analytical techniques, Inorganic compounds, Organic matter, Sedimentology, Turbidity.

Identifiers: "Peoria Lake (III), Organic carbon.

Trace elements in bottom sediments of Upper Peoria Lake were determined from samples taken

from 8 sites. The lake is an impoundment of the Illinois River near Peoria, Ill. The samples were subjected to analysis by X-ray fluorescence, neutron
activation, optical emission, atomic absorption,
radiochemical preparation techniques, and wet
chemical methods. Major constituents determined
were silicon, aluminum, iron, magnesium, calcium, potassium, inorganic carbon, and organic carbon. Titanium, manganese, sodium, phosphorus,
and sulfur were found in smaller amounts. Trace
elements measured were lead, zinc, cadmium,
copper, nickel, boron, chromium, beryllium,
vanadium, cobalt, mercury, arsenic, bromine,
lanthanum, and scandium. Sieve and pipette
analyses revealed that the sediments are sandy and
clayey silts. X-ray diffraction indicated an illitetaolinite-chlorite mixed-lattice clay fraction.
Upper Peoria Lake bottom sediments contained
more lead, zinc, and chromium than previously
studied surficial sodiments from southern Lake
Michigan, but had lower levels of arsenic and
bromine. Concentrations are directly related to organic carbon content and, to some extent, to the
sus than 2-micron clay fraction. Edit premise carbromine. Concentrations are directly related to or-ganic carbon content and, to some extent, to the less than 2-micron clay fraction. Both organic car-bon and clay fractions increase southward in Upper Lake Peoria and are larger in the navigation channel than in the shallows. Turbidity appears to have an inverse relation to trace element concen-tration. (Woodard-USGS) W73-01474

DISSOLUTION KINETICS OF CALCIUM CAR-BONATE IN SEA WATER: I. SATURATION STATE PARAMETERS FOR KINETIC CALCU-LATIONS, Yale Univ., New Haven, Conn. Dept. of Geology

and Geophysics.
For primary bibliographic entry see Field 02J.
W73-01487

DISSOLUTION KINETICS OF CALCIUM CAR-BONATE IN SEA WATER: II. A KINETIC ORIGIN FOR THE LYSOCLINE, Yale Univ., New Haven, Conn. Dept. of Geology

and Geophysics.
For primary bibliographic entry see Field 02J.
W73-01488

DIFFUSION AND REACTION PROFILES OF DISSOLVED MANGANESE IN THE PORE WATERS OF MARINE SEDIMENTS, Edinburgh Univ. (Scotland). Grant Inst. of Geolo-

For primary bibliographic entry see Field 02J. W73-01489

TRANSFORMATION OF MANGANESE IN A WATERLOGGED SOIL AS AFFECTED BY REDOX POTENTIAL AND PH, Louisiann State Univ., Baton Rouge. Dept. of

Agronomy.
For primary bibliographic entry see Field 02G.
W73-01493

THE TRANSPORT OF CATIONS IN SOIL COLUMNS AT DIFFERENT PORE VELOCI-

Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
For primary bibliographic entry see Field 02G.
W73-01497

WINTER SURVIVAL OF FECAL INDICATOR BACTERIA IN A SUBARCTIC ALASKAN

Environmental Protection Agency, College, Alaska. Alaska Water Lab.

Group 5B-Sources of Pollution

EPA-R2-72-013, August 1972. 41 p, 10 fig, 5 tab, 35

Descriptors: *Coliforms, *Winterkilling, *Arctic, *Enteric bacteria, *Bioindicators, Environmental effects, Alaska, Cold resistance, Water pollution sources, Water pollution effects, Ice cover, Rivers, Dissolved oxygen, Water temperature, Path of pollutants, Water chemistry, Water quali-

ty. Mentifiers: *Fecal indicator bacteria

Identifiers: *Fecal indicator bacteria in a subarctic Alaskan river was studied during the winter of 1969-70 when there was total ice cover and the water temperature was 0 deg C. Most of the domestic pollution entered the river from one source. Since no additional pollution entered downstream from this source, an uninterrupted study covering 7 days of flow (210 river miles) was possible. Nine sample stations were established to obtain total coliform, fecal coliform, enterococcus and water chemistry data. Samples were collected four to eight times from each station during the 2-week period of data collection, and a discharge measurement was made at each station during the same period. Bacteria survival was examined with and without consideration for the effect of diution. After 7 days flow time, total coliforms to 2.1-4.2 percent, and the enterococci to 18.1-37.3 percent depending on dilution consideration. (Knapp-USGS)

WATER QUALITY AT MIAMI INTERNA-TIONAL AIRPORT, MIAMI, FLORIDA, 1971-

7-21, Geological Survey, Tallahassee, Fla. H. J. Freiberger, and B. F. McPherson. Geological Survey Open-file Report 72023, October 1972. 50 p., 5 fig. 15 tab, 6 ref.

Descriptors: "Water quality, "Chemical analysis, "Canals, "Ditches, "Florida, Water pollution sources, Heavy metals, Trace elements, Sediments, Fish, Sampling, Data collections, Oil, Polychlorinated biphenyls, Pollutant identification, Industrial wastes. Identifiers: "Miami International Airport (Fla), "Polychlorinated naphthalenes.

*Polychlorinated naphthalenes.

The quality of water, sediment, and biota was determined at four sites in canals and drainage ditches at Miami International Airport during high-and low-water periods and during summer and winter 1971-72. Concentrations of common ions, such as calcium, sodium, chloride, and magnesium were above average for fresh water because of periodic salt-water intrusion. Nitrogen, phosphorus, and pesticides were in higher concentrations than typical for undisturbed areas of south Florida, but not higher than usual for the urban coastal area. Arnenic, lead, iron, and chromium (probably associated with recent discharges from industrial sources) all exceeded, in one or more samples, the U.S. Public Health Service's recommended upper limits for metals in water. Only iron sormally exceeds these standards in the natural waters of south Florida. PCB's (polychlorinated ophnayla) were detected in most samples and were in concentrations as high as 1,000 micrograms per kilogram in fish. In addition to pesticides and PCB's, another group of persistant chlorinated compounds, PCN's (polychlorinated aphthalenes) were detected in water, sediment, and fish. This is the first known detection of these compounds in the environment. (Woodard-USGS) W73-01513

SYSTEM FOR MEASURING BOD BY ELEC-TROLYSIS, Iowa State Univ. Research Foundation, Inc., Ames. (assignee). For primary bibliographic entry see Field 05D. W73-01541

W73-01513

NUCLEAR POWER: THE SOCIAL CONFLICT, Georgia Inst. of Tech., Atlanta. Dept. of Civil En-

gineering. E. C. Tsivoglou. Environmental Science and Technology, Vol 5, No 5, p 404-410, May 1971. 6 fig, 7 ref.

Descriptors: "Nuclear powerplants, "Reactors, "Hazards, "Radioactive wastes, Radioactive waste disposal, Water pollution, "Thermal powerplants, Costs, Economics, Eavironmental effects, Reactors, Puels, Legislation, Cooling, Generators. Identifiers: "Nuclear power, BWR reactors, PWR reactors, Heat load, Fission products.

reactors, Heat load, Fission products.

Despite the conflict over nuclear plant discharges, the risks are actually quite small, but could be further reduced. There is no real need for either radioactive pollution or for blackouts, so far as nuclear power is concerned. By known technology and for very reasonable costs, radioactive pollution from nuclear power plants can be virtually eliminated without impeding the development of the industry. Sources of radioactive wastes in the plant are discussed followed by a description of the environmental fate of radioactive wastes released in solid, liquid or gaseous forms. Risks and hazards associated with radioactive releases are discussed. A technical description of problems connected with operation of BWR reactors and PWR reactors is given followed by a discussion of costs. Both 'zero-release' (Gestinghouse) and 'mini-release' (G.E.) pollution control systems would cost less than 1% of the capital cost of a new nuclear powerplant. (Oleszkiewicz-Vanderbilt) W73-01565

ANALYSIS OF BUOYANT JETS WITHIN THE ZONE OF FLOW ESTABLISHMENT, Oak Ridge National Lab., Tenn. E. Hirst.

Report ORNL-TM-3470, August 1971. 43 p, 24 fig, 1 tab, 14 ref.

Descriptors: *Jets, *Buoyancy, *Mathematical models, *Thermal pollution, Water pollution, Thermal powerplants, Stratification, Outlets, Momentum equation, Mixing, Diffusion, Froude Number, Velocity, Model studies. Identifiers: *Zone of flow establishment, *Buoyant jets, Thermal plumes, Differential equations

In order to assess the ecological consequences of thermal discharges from steam-electric power plants, one must be able to predict the physical changes (temperature, velocity, salinity) induced by these discharges. This work is concerned with the mathematical prediction of these physical properties in the zone of flow establishment (ZFE), for thermal effluents discharged as buoyant jets through round, submerged diffusers. The method developed here uses the integral equations of mass, energy, salt, and momentum conservation. The solution to these equations includes the length of the ZFE, and the values of jet width, jet orientation, and centerine temperature and salinity at the end of this zone. Results obtained with the method agree well with the limited experimental data available and with existing semicompirical correlations. This method can be used to provide the necessary initial conditions for conventional (applicable only in the zone of established flow) buoyant jet prediction methods. (Oleszkiewicz-Vanderbilt) W73-01566

DEPOSITION OF FINE SEDIMENTS IN TURBU-LENT FLOWS, Gainesville. Dept. of Coastal and Oceanographic Engineering. For primary bibliographic entry see Field 02J. W73-01567. THE PREVENTION OF STRATIFICATION IN RESERVOIRS, For primary bibliographic entry see Field 05G. W73-01569

FLOW INTO A STRATIFIED RESERVOIR. California Univ., Berkeley.

Copy available from GPO Sup Doc as EP1.23/2:72-037; \$0.65; microfiche from NTIS as PB-213 072, \$0.95. Environmental Protection Technology Series Report EPA-R2-72-037, August 1972. 64 p, 16 fig. 5 tab, 11 ref. EPA 15040 EJZ.

Descriptors: "Stratified flow, "Density stratifica-tion, "Density currents, "Thermal stratification, "Pumped storage, Reservoir operation, Water cir-culation, Currents (Water), Mixing, Hydraulic models, Model studies, Path of pollutants, Hydraulic jump, Identifiers: Stratified reservoirs.

Identifiers: Stratified reservoirs.

The flow caused by a line source discharging into a stagnant, linearly density stratified reservoir was studied in a tank. The flow enters the reservoir as a horizontal line jet but immediately passes through an internal hydraulic jump and forms a slowly moving wedge of fluid mixed into the injection by the jump. Ahead of this mixed layer the inflow pushes a wide layer termed the entering layer, which extends to the opposite end of the reservoir and consists of fluid already in the reservoir before the jet. The inflow also induces a series of layers of flow in alternating directions above and below the entering layer. The mixed layer was made visible by mixing blue dye into the supply fluid. The leagth, thickness, and tip speed of the mixed layer were measured as a function of time, and an empirical scaling relationship was derived to relate the differing experimental conditions. Use of the scaling factors allows the results to be applied to prototype reservoirs to predict the extent of mixed layers which might occur during the pumping phase in a jump-storage reservoir. (K-napp-USGS)

TECHNICAL ASPECTS OF CONTROLLING WATER POLLUTION RESULTING FROM THERMAL POWER PLANTS WITH CONVENTIONAL AND NUCLEAR GENERATORS (ASPECTS DE NATURE TECHNIQUE QUE (ASPECTS DE NATURE TECHNIQUE QUE PRESENTENT, EN MATHERE DE PROTEC-TION DES EAUX, LE PRELEVEMENT ET LA RESTIT UTION D'EAU DE REFROIDISSE-MENT POUR LES CENTRALES THERMIQUES CLASSIQUES OU ATOMIQUES). Departement Federal de l'Interieur, Bern (Swit-zerland).

For primar W73-01572 ary bibliographic entry see Field 05G.

REPORT ON THE ANALYSIS OF THERMAL POLLUTION OF THE RHINE RIVER RESULTING FROM POWERFLANTS (BEHTRAG ZULASNIGEN KRAFTWERK-SBELEGUNG) DES RHEINS IM HINBLICK AUF DIE THERMISCHE BELASTUNG), Kernforschungszentrum, Karlsruhe (West Germany), Institut fuer Angewandte Reaktorphysik. For primary bibliographic entry see Field 05C. W73.01573 bibliographic entry see Field 05C. For primary W73-01573

USE OF SIMULATION IN THE DEVELOP-MENT OF REGIONAL PLANS FOR PLANT SIT-ING AND THERMAL EFFLUENT MANAGE-MENT, Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 05C.
W73-01575

THE ROLE OF ELECTRIC POWER IN MINIMIZING TOTAL POLLUTION FROM ENERGY USE,
Westinghouse Electric Corp., Philadelphia, Pa. Environmental Systems Dept.
For primary bibliographic entry see Field 05C.

INORGANIC SULFUR OXIDATION BY IRON-OXIDIZING BACTERIA, Syracuse Univ., N.Y. Dept. of Biology. For primary bibliographic entry see Field 05C.

TOXIC SUBSTANCES LIST, 1972 EDITION. National Inst. for Occupational Safety and Health, Rockville, Md.

HEW, Health Services and Mental Health Administration Publication HSM72-10265, June 1972, H. E. Christensen, Editor, 563 p.

Descriptors: "Water pollution sources, "Toxins, "Toxicity, Pollutants, Chemicals, Public health, Safety, Bibliographies. Identifiers: "Toxic substances, "Poisonous sub-

The second edition of the Toxic Substances list which is prepared at least annually under the Occupational Safety and Health Act of 1970 lists some 13,000 toxic substances with perhaps double that number yet to be included. Included are mined, manufactured, processed or synthesized inorganic and organic substances, as well as refined substances of natural origin and waste products. Excluded were unpurified extracts of animal or vegetable origin and trade name products representing compounded or formulated mixtures availate as commercial products. Information for each substances includes: Chemical Substance Name, Chemical Identification Data, Wiswesser Line Notation, Synonym Information, Toxic Dose Data. U. S. Occupational Standards, and NIOSH Criteria Documents. (Cowgill-OWRR) W73-01631

SIMULTANEOUS DISPERSION AND DECAY OF RADIOACTIVE WASTES, Kansas State Univ., Manhattan. Dept. of Chemi-cal Engineering. S. K. Choi, L. T. Fan, and L. E. Erickson. Health Physics, Vol 22, No 2, p 177-186, February 1972. 8 fig, 7 ref, append.

Descriptors: "Radioactive wastes, "Dispersion, "Degradation (Decomposition), Rates, "Simulation analysis, Solid wastes, Liquid wastes, Laplaces equation, Time, Forecasting, "Path of pollutants. pollutants. Identifiers: *Transformation technique, Concen-tration changes, Analytical expressions.

A mathematical simulation of a rate process averning the transport and decay of a radioactive substance in a solidified waste and the surrounding fluid is presented. A certain radioactive component distributed in the solidified waste dissolves at the water and then diffuses out to the surrounding fluid because of the difference in concentration. The decay of the radioactive substance in both the solid and the fluid of the system is an irreversible first order rate process. The Laplace transformation technique, as a function of time and position for the porous body, and of time for the surrounding fluid, is used to derive the analytical expressions for the change of concentration of the radioactive substance. These expressions are useful for predicting concentrations in the system the randoctive substance. These expressions are useful for predicting concentrations in the system as well as in determining the effective diffusivity and decay coefficient of the radioactive substance. (Rasign-PAI)

MERCURY IN THE ENVIRONMENT: A SUM-MARY OF INFORMATION PERTINENT TO THE DISTRIBUTION OF MERCURY IN THE SOUTHERN CALIFORNIA BIGHT, Southern California Coastal Water Research Pro-ject, Los Angeles. D. R. Young. November 1971. 38 p. 12 fig, 8 tab, 57 ref.

Descriptors: *Mercury, *Distribution patterns, *Environmental effects, *Toxicity, *Marine animals, *Public health, Physiological ecology, Water pollution sources, Standards, Monitoring, *California. *California. Identifiers: *Southern California Bight.

Data on concentrations of mercury in various reservoirs of the Southern California Bight are scarce. Data that are available have been evaluated and summarized for this report. An inventory of the data for the major input modes and their relative contributions are estimated. The chemical forms of mercury and the mechanisms whereby they are transformed from a harmless state to a very toxic species are discussed. In presenting the effects of mercury on marine life and public health the possible physiological effects of both chronic and acute exposures to mercury are outlined. Concentration levels at which various mercury compounds are toxic to aquatic organisms and other biological relationships involving mercury are explained. Recommendation to help establish rational guidelines on acceptable mercury levels and the monitoring of these levels are presented. (Ensign PAI) sign-PAI) W73-01637

FOREST FERTILIZATION (A STATE-OF-T-HE-ART REVIEW AND DESCRIPTION OF EN-VIRONMENTAL EFFECTS), Pacific Northwest Water Lab., Corvallis, Oreg. For primary bibliographic entry see Field 05°C. W73-01638

FISHING A NUCLEAR-HEATED BALTIC.

N. Foy. New Scientist, (London), Vol 52, No 774, p 172, December 16, 1971.

Descriptors: "Thermal pollution, "Fishing, "Nuclear power plants, "Heated water, "Electric power industry, Computer models, Ecology, Sea water. Identifiers: *Sweden, *Baltic Sea.

Computer application to the study of fish ecology in the Baltic Sea is being investigated by IBM-UK and the Swedish Environment Protection Board. This project is the first step in a 20-year study of the Baltic Sea to assess thermal pollution effects of nuclear power stations. The Swedish government has been collecting data for 10 years from nuclear power plant sites at Simpevarp, Marviken, and Stora Askoe, and will continue data collection for another 10-year period. Ten or twelve more nuclear stations utilizing the Baltic for their cooling water are planned by 1980. Data from nets, instruments, and fishermen's diaries are to be utilized by IBM to create an ecological model describing complex interactions between nutrition patterns, competing species, stimuli responses, and other behavioral patterns and effects away from the heated areas. (McEntyre-PAI)

TRACKING WASTE BY RADIOACTIVITY, Wimpey (George) and Co., Ltd., London (England). M. R. Wright. Hydrospace, (London), Vol 4, No 5, p 42-43, October, 1971, 1 tab.

Descriptors: *Waste disposal, *Industrial wastes. *Radioactivity techniques, *Tracers, *Clays. Water pollution effects, On-site investigations. *Path of pollutants.

Identifiers: *St. Austell Bay, *China clay plant, *Scandium oxide, Glass, England.

*Scandium oxide, Glass, England.

A hydrographic survey in St. Austell Bay, Cornwall, England, was undertaken in 1969 to determine feasibility of offshore discharging of wastematerial from a china clay plant in the St. Austell area. The survey included comprehensive echo soundings, a study of currents and tidal streams, examination of salinities and temperatures, and an intensive seabed sampling program. To obtain additional information, specially prepared glass with a small quantity of radioactive scandium oxide was combined with clay waste slurry for deposition on the seabed for tracer studies. A total of 22% of the tracer was located over an area of 10.6 square miles and a further survey found 14% of the tracer covering an area of 13.8 square miles. A graphic extension of aerial spread of the radioactive tracer cover a 1000 day period showed some 29 square miles would become affected by the waste. While this radioactive tracer survey was not a highly accurate yardstick for measuring pollution from long-term disposal of the clay wastes, it did establish that the proposed outfall disposal scheme would cause an unacceptable level of pollution. The outfall scheme was therefore abandoned and other methods of disposal investigated. (McEntyre-PAI)

MEDITERRANEAN POLLUTION-ANOTHER YEAR OF NEGLECT, T. Loftas. Scientist and Science Journal, Vol 51, No 760, p 144-145, July 15, 1971.

Descriptors: *Water pollution sources, *Oil pollu-tion, *Industrial wastes, *Sewage, Runoff. Identifiers: *Mediterranean Sea, Italy.

Identifiers: *Mediterranean Sea, Italy.

The ecological condition of the 970,000 square mile Mediterranean Sea is rapidly deteriorating because of the growing burden of pollutants entering the sea, including oil, municipal sewage, industrial effluent, and agricultural run-off. None of the 6000 registered beaches in Italy complies with the maximum 100 bacteria per 100 c.c. of water standard recently set by the Italian Health Ministry. Due to the method of interchange of Mediterranean and Atlantic waters, any pollutant that is lighter than Mediterranean water remains trapped in the sea. Such a pollutant is oil, which is estimated to be deliberately or accidentally discharged into the sea at the rate of 100,000 tons annually, and which may forever remain in the sea in that its rate of biodegradability is unknown. Sources of mediterranean oil pollution are described. The industrial effluent problem is also discussed, and it is suggested that, due to the polluted rivers entering the sea, the amount of the sea's phytoplankton (oxygen producers) is diminishing from year to year, while the amount of seston (oxygen consumers) is increasing. Ten Mediterranean states at a recent conference suggested that they take joint action to abate the pollution. (McEntyre-PAI)

ELECTRONMICROSCOPIC OBSERVATIONS ON THE DEGRADATION OF CELLULOSE FIBRES BY CELLVIBERIO FULVUS AND SPOROCYTOPHAGA MYXOCOCCOIDES, Uppsala Univ. (Sweden). Biokemiska Institu-B. Berg, B. V. Hofsten, and G. Pettersson. Journal of Applied Bacteriology, Vol 35, No 2, p 215-219, June 1972. 13 fig, 7 ref.

Descriptors: *Cellulose, *Fibers (Plant), *Microbi-al degradation, *Electron microscopy, Cotton, Pollutant identification. Identifiers: *Sporocytophaga myxococcoides, *Transmission electron microscopy, *Cellvibrio fulvus, *Scanning electron microscopy, Flexibac-terium, Agars, Fate of pollutants, Light microsco-

Group 58-Sources of Pollution

Cellvibrio fulvus and Sporocytophaga myxococoides were grown on different types of cellulose fibres and the degradation was followed by means of light and electron microscopy. Some of the specimens were freeze-dried, contrasted with gold and examined by scanning electron microscopy. Other specimens were examined with transmission electron microscopy after being (1) prefixed in buffered 2.5 percent gluteraldehyde, (2) brought to pH 6.8, (3) further fixed in 2 percent osmium tetraoxide solution suspended in 2 percent agar, dehydrated, embedded in Epon, and (4) sectioned on an ultratome with glass or diamond knives. The very compact fibres prepared from cotton were degraded alowly by C. fulvus. The bacteria penetrated into the lumen of the fibres, accumulated there in large numbers, and degraded the fibres from within. Sporocytophaga myxococoides attacked fibres both from the outside and from within by making close contact with the cellulose. Lignin free pulp fibres, which have a very open structure, were rapidly degraded by both kinds of bacteria. Cellvibrio fulvus also degraded these fibres from within. It is concluded that structure of the fibre greatly influences the rate at which different kinds of cellulolytic bacteria decompose cellulose. (Byrd-Battelle)

ASSIMILATION AND TOXICITY OF EX-OGENOUS AMINO ACIDS IN THE METHANE-OXIDIZING BACTERIUM METHYLOCOCCUS

OXIDIZING BACTERIUM METHYLOCOCCUS CAPSULATUS, Queen Elizabeth Coll., London (England). Dept. of Microbiology. M. Escleston, and D. P. Kelly. Journal of General Microbiology, Vol 71, No 3, p 541-554, August 1972. 5 fig, 6 tab, 30 ref.

Descriptors: "Toxicity, "Amino acids, "Methane bacteria, "Path of pollutants, Absorption, Pollu-tant identification, Growth rates, Cultures, Radiochemical analysis, Metabolism, Inhibition, Radioactivity techniques, Oxidation, Kinetics, Colorimetry, Ultraviolet radiation, Filtration, Water pollution effects.

Identifiers: *Methylococcus capsulatus, *Assimilation, Organic bases, Biosynthesis, Culturing techniques, Biological magnification, C-14, Paper chromatography, Autoradiography, Purines, Pyrimidines, Nucleic acids, Liquid scintillation, Culture media.

Tracer studies are described which deal with the pathways for amino acid synthesis used by Methylococcus capsulatus, and with kinetics and relief of growth inhibition by amino acids. Bacterial growth was followed by optical density measurements using a colorimetric technique. Carbon-14-labelled amino acids are incorporated by exponentially growing cultures, and these amino acids are separated from culture samples by ascending paper chromatography. The radioactive areas (amino acids) on chromatograms were located by autoradiography. purines and ascending paper chromatography. The radioactive areas (amino acids) on chromatograms were located by autoradiography, purines and pyrimidines detected by u.v. light, nucleic acid bases separated by a filtration technique, and radioactivity of cells on membrane filters was determined by liquid scintillation spectrometry. Of 21 amino acids tested, only L- and D-threonine, L-henylalanine, L-histidine, L-tyrosine and L-homoserine inhibited exponential growth of Methylococcus capsulatus at 1.0 mM. Inhibition by L-threonine was relieved by L-methionine, L-homoserine, L-alanine and L-valine, but not by L-lysine, 2,6-diaminopimelic acid or L-arginine. C-14-labelled methane, L-asparate, L-threonine, L-homoserine, L-glutamic acid, L-phenylalanine and L-tryptophan were all assimilated. The results suggested that the branched pathways for threonine, instendencine, methionine and lysine synthesis from asparate is functional. An explanation of threonine-inhibition in terms of an interference with end-product regulation of this pathway is proposed. (Byrd-Battelle) FACTORS AFFECTING THE CONCENTRA-TION OF FAECAL BACTERIA IN LAND-DRAINAGE WATER, West of Scotland Agricultural Coll., Auchincruive (Scotland). Dept. of Microbiology. M. R. Evans, and J. D. Owen. Journal of General Microbiology, Vol 71, No 3, p 477-485, August 1972. 4 fig, 8 ref.

Descriptors: "Drainage water, "Parm wastes, "Ba-viroamental effects, "Subsurface drainage, "En-teric bacteria, Subsurface waters, Hogs, Flow rates, Equations, Water pollution sources, Per-colation, Soil water movement, Seepage, Pollutant identification, Biochemical oxygen demand, E. coli, Filtration, Membranes, Discharge (Water), Weir gauges, Clay Joan, Sands, Surface runoff. Identifiers: Enterococci, Biochemical tests, Fecal coliforms.

coliforms.

The rate of discharge and the concentration of faccal bacteria in the water from a subsurface field
drain were monitored by standard techniques initially for one winter without application of animal
excrement to the pasture, and, subsequently, for
two winters when pig excrement was sprayed over
the pasture. The concentrations of Bacherichia
coli and enterococci in the water were affected by
three main factors: the flow rate of the drain
discharge; the number of bacteria in or on the soil
and vegetation; and the application to the land of
large volumes of semiliquid animal excrement
over short periods of time. In the absence of excrement application, the concentration of facal
bacteria in the water was related to the flow rate
and to time by an equation of the form: log bacteria
al concentration equals a plus b log flow rate
minus c days, where a, b and c are constants. The
concentrations of bacteria in the water declined
with time, the 90 percent reduction times being 57
days for E. coli and 96 days for enterococci. The
spraying of pig excrement over the pasture cays for E. Con and 30 days for enterococci. The spraying of pig excrement over the pasture resulted in a 30- to 900-fold increase in the concentrations of faecal bacteria in the drain discharge within 2 h of the start of the spraying. The concentrations of faecal bacteria returned to their normal levels over a period of 2 to 3 days. (Byrd-Battelle) W73-01664

EFFECT OF BUFFER INTENSITY AND OR-GANIC MATTER ON THE OXYGENATION OF FERROUS IRON, Quebec City Water Board (Quebec). Industrial Waste Div.

aste Div.

Waste Div.
R. Jobin, and M. M. Ghosh.
Journal of the American Water Works Association, Vol 64, No 9, p 590-595, September 1972. 7 fig, 3 tab, 18 ref.

Descriptors: *Iron, *Oxygenation, *Reduction (Chemical), *Hydrogen ion concentration, Chemical reactions, Heavy metals, Organic acids, Water analysis, Chelation.

Identifiers: *Tannic acid, *Humic acids.

Identifiers: "Tamic acid, "Humic acids.

Research was initiated to determine the effect of buffer intensity and the organic content of water on the rate of conversion of soluble Fe (II) to insoluble Fe (III). The effect of buffer intensity was determined by varying the alkalinity of synthetic water using different concentrations of sodium carbonate and bubbling carbon dioxide and air through the water. The results indicate that oxygenation of Fe (III) in aqueous medium is a first-order reaction, and that buffer intensity affects the Fe (III) oxygenation rate at values higher than .004 e/pH. To test the effects of organic compounds on oxygenation of Fe (III), various concentrations of humic and tannic acid were added to test waters. The results show that both acids retard the rate of oxygenation, with tannic acid having more effect than humic acid. In the presence of organic matter, the Fe (III)-Fe (III) redox couple acts as a catalyst for the oxidation of organic matter. In such systems, both complexation of Fe (III) and reduction of Fe (IIII) by organic matter are possible. A model was also developed to show the efficiency of iron removal processes. (Little-Battelle)

W73-01668

MIXING OF A HEATED SURFACE JET IN TURBULENT CHANNEL FLOW, California Univ., Berkeley. Dept. of Civil Engineering; and California Univ., Berkeley. Hydraulic Engineering Lab.

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Waste Heat Management Report Series, Report No. WHM-1, June 1972. 166 p, 60 fig, 4 tab, 49 ref.

Descriptors: *Jets, *Buoyancy, *Heated water, Temperature, Froude number, Hydraulics, Chan-nel flow, Turbulent flow, Thermal powerplants, Mixing, Diffusion, Density, Water pollution, Pric-tion, Mathematical models, Laboratory studies, Dimensional naalysis, Entrainment. Identifiers: *Heated surface jets, *Surface jets, Densimetric Froude number, Dilution, Tempera-ture profiles.

sturie profiles.

Studied is the situation of a heated water surface jet flowing at the mean local velocity in open channel flow. The jet contains no excess momentum that can cause mixing by relative motion of parallel streams. Normalized axis temperature, plume width, and layer depth are chosen to describe the temperature field. Dimensional analysis is used to determine the fundamental independent variables of a distance ratio, a depth ratio, a friction factor, and a densimetric Froude number. Within limited ranges, axis temperature is measured to be independent of the depth ratio and Froude number, and is only weakly dependent on the friction factor. Mixing is significant, but dilution is less han for jets with momentum. Results for layer depth are shown vs. distance ratio and are largely independent of depth ratio, friction factor and Froude number. Choice of definition of layer depth is important, especially far from the source. Local details of surface and vertical temperature profiles are also shown. (Oleszkiewicz-Vanderbilt) W73-01703

MACROINVERTEBRATES OF THE MISSISSIP-PI RIVER IN THE MONTICELLO REGION, Saint Cloud State Coll., Minn. Dept. of Biology.

D. R. McConville.

M. A. Thesis, December 1969. 85 p, 3 fig, 10 tab, 37 ref. OWRR-B-032-Minn (1).

Descriptors: *Mississippi River, *Biology, *Sediments, *Thermal pollution, Nuclear powerplants, Water pollution, Temperature, Dissolved oxygen, Dissolved solids, Aquatic habitats, Sampling, Physicochemical parameters, Water quality, Limpology.

nology. Identifiers: "Macroinvertebrates, "Biological sur-veys, Bottom samplers, Qualitative sampling, Quantitative sampling.

Quantitative sampling.

The study covers the area that will be affected by thermal discharges from the nuclear steam-electric generator located on the Missinsippi River near Monticello, Minnesota. The facility will use a once through cooling system which will utilize up to 65% of the low flow in the river. Basically, water quality data indicate that the river environment in the Monticello area is relatively stable and free from serious organic pollution. Qualitative shoreline samples were collected during the summer and fall of 1968. During qualitative shoreline samples were collected during the summer and fall of 1968. During qualitative anapling, representatives of 11 orders, 32 families, and 66 genera of macroinvertebrates were collected. The major groups represented in this survey were the Coleoptera, Ephemeroptera, and the Hemiptera. The major components of the invertebrate bottom fauna were the Tricoptera (Caddis flies) and the Ephemeroptera (May flies). (Oleazkiewicz-Vanderbilt)

THERMAL PLUMES IN LAKES: COMPILA-TIONS OF FIELD EXPERIENCE, Argonne National Lab., Ill. Center for Environ-mental Studies.

J. V. Tokar. Report ANL/ES-3, Waste Heat Disposal, August 1971. 169 p. 47 fig, 26 tab, 24 ref.

Descriptors: "Great Lakes, "Thermal pollution, "Lakes, "Temperature, Water pollution, Thermal powerplants, Stratification, Density, Outlets, Hydraulics, Hydraulics, Hydraulics, Rhodamine, Tracking techniques. Identifiers: "Thermal plumes, Powerplant inventory, State-of-the-art, Outfalls, Thermal discharges.

This report is one part of a three-part survey attempting to delineate the state-of-the-art on the available methods for predicting the extent and temperature structure of thermal plumes existing at power-plant outfalls. Emphasis is placed on plumes within large stratified lakes. Two companion reports include a review of analytical, numerical, and hydraulic modeling of thermal plumes and have concentrated on predictive techniques. Field data and experience that could possibly be used to validate the predictive methods are described. An inventory of the existing or proposed power plants sited along the shores of the Great Lakes is included. (Oleszkiewicz-Vanderbill) ierbilt) W73-01709

ENVIRONMENTAL ENGINEERING PROGRAMS QUARTERLY TECHNICAL PROCRESS REPORT - JANUARY, FEBRUARY, MARCH 1971.
Hanford Engineering Development Lab., Richland, Wash.

Report HEDL-TMB-71-67, April 1971. 50 p, 18 fig, 5 tab. AEC AT (45-1)-2170.

Descriptors: *Model studies, *Mathematical models, *Heat, *Temperature, Thermal powerplants, *Thermal pollution, Powerplants, Water pollution, Nuclear powerplants, Mississippi River, Algorithms, Intakes, Structures, Beneficial use, Heat transfer, Environmental effects, Electric power production.

Identifiers: *Waste heat, *Heat utilization. *Heat distriction.

power production. Identifiers: *Waste heat, *Heat utilization, *Heat dissipation, COL HEAT system, TOPLYR

system.

Technical progress made by WADCO and WADCO contractors during January, February and March 1971 is summarized. This is the third Quarterly Progress Report covering Eavironmental Engineering Programs at WADCO. Developments of simulation modeling of environmental effects of thermal generation are presented. Development of the COL HEAT and TOPLYR systems is discussed. Regional modeling of surface water temperature from projected power growth is discussed on the basis of Lower Mississippi River simulation and Northeast River temperature simulations. The last section, hydro-environmental evaluation of nuclear power stations, deals with the development of algorithms for evaluating nuclear plant heat dissipation methods, the identification and evaluation of beneficial uses of waste heat discharged from thermal powerplants, and the design of thermal powerplants and the design of thermal powerplants intake structures. (Oleszkiewicz-Vanderbilt)

A UTILITY SPONSORED ENVIRONMENTAL SURVEILLANCE AND RADIOECOLOGICAL RESEARCH PROGRAM FOR A COASTAL NUCLEAR POWER FLANT, Florida Univ., Gainesville. Dept. of Environmental Regineering. tal Engineering. C. E. Roessler, W. E. Bolch, J. F. Gamble, and W.

B. Johnson, Jr. American Journal of Public Health, Vol 62, No 10, p 1379-1385, October 1972. 5 fig. 5 tab, 7 ref.

Descriptors: *Radioecology, *Radioactivity, *Radioactive wastes, *Nuclear powerplants, Water pollution, Air pollution, Power plants,

Sampling, Ecology, Public health, Gamma rays, Bioassay, Terrestrial habitats, Marine biology, Florida.

Identifiers: *Crystal River Nuclear Powerplant, Radiological research, Radiological health.

Radiological research, Radiological health.

The Crystal River Nuclear Station will have an initial capacity of 855 megawatts. At the site the utility company is satisfying its radiological surveillance responsibilities by means of contracts with the State health agency and with one of the state universities. In addition, the utility is supporting ecological research beyond that imposed by current regulatory requirements. The contract with the University has made a wide range of interests and expertise available to the project. Both marine and terrestrial studies will be performed. Since both the State and utility have responsibilities which require them to conduct or support radiological surveillance, this cooperative program reduces the total cost. Since the State health agency has entered into a similar agreement with respect to two other nuclear power plant sites in the State, standardization and intercomparability of data are assured. (Oleszkiewicz-Vanderbilt) W73-01718

RESEARCH RELATED TO THE PREDICTION OF TEMPERATURE AT A POWER REACTOR SITE ON THE LOWER COLUMBIA RIVER. Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.

Battelle Memorial Institute, Richland, Washington, Research Report, March 1, 1969. 114 p, 40 fig, 20 tab, 33 ref.

Descriptors: "Thermal pollution, "Columbia River, Hydrology, "Meteorology, "Model studies, Geological surveys, Grand Coulee Dam, Hydrodynamics, Heated water, Nuclear power-

Identifiers: *COLHEAT routine, *Inlet temperature, *Estuary model, Thermograph, Colum Treaty, Thermal regime, Canadian Dam model.

The main objective was to determine whether a nuclear power plant located on the Lower Columbia River could be cooled directly by the river and still operate within standards set by Oregon and Washington. The project was carried out as four separate tasks. The tasks were: (1) to study the area above Grand Coulee Dam; (2) to treat the system between Grand Coulee Dam and Bonneville Dam; (3) to analyze the Columbia River Estuary below Bonneville Dam; and (4) to summarize the field measurements collected during 1968. Conclusions reached as a result of the survey are: significant temperature reductions will result from normal unoptimized operation of the Columbia Treaty dam system. Temperature benefits will be equilibrated by the time a given water mass reaches the Bonneville pool, due to extended travel time. Under 1938 conditions, the worst year on record, temperatures exceeding 20 C are projected for a maximum of 45 days. Below the Trojan plant, the extent of peaking from tidal actions is not expected, under any of the study conditions, to produce conditions which go outside 2 F, the temperature difference standard adopted for the lower Columbia River by Oregon and Washington. The standard error for measurement of temperature differences is plus or minus 0.25 C or 22.3% of the allowable stream rise. (Osborne-Vanderbill) The main objective was to determine whether a

TEMPERATURE PREDICTION AND CURRENT MEASUREMENTS RELATED TO THE DEVELOPMENT OF A POWER REACTOR SITE ON THE LOWER COLUMBIA RIVER IN THE VICINITY OF KALAMA, WASHINGTON. Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs. Battelle Memorial Institute, Richland, Washing ton, Pacific Northwest Laboratory, Research Re port, June 3, 1969. 74 p. 48 fig. 1 tab, 19 ref.

Descriptors: "Temperature, "Forecasting, "Currents (Water), "Thermal powerplants, Heated water, Mixing, Dye releases, Nuclear powerplants, Hydraulics, Rffluents, "Columbia River, "Washington, "Thermal pollution. Identifiers: Thermographs, River simulation, Flow tides, Thermal discharge, "Kalkma (Wash).

The temperature regime of the Columbia River, with and without thermal releases at the Kalama site, river mile 78.0, and the Trojan site, river mile 72.8, was modeled downstream to the lower end of Puget Island, river mile 37.6. Current measurements in the reach of the river surrounding the proposed site reveal a homogeneous hydraulic regime. Mathematical simultaneously from both sites reveals no interaction or superposition of the effluent in the reach between the two sites Predictive modeling also shows that no combination of circumstances of tidal height, post-columbia treaty river flow, and mixed thermal discharges from the sites, interact in any way to cause waves or pulses river flow, and mixed thermal discharges from the sites, interact in any way to cause waves or pulses of warm water of significant size at extended distances downstream from the two plants. Based on the published temperature rise values in the Oregon and Washington State standards (2.5 F), it is believed that a 1000 MWe generating plant with a properly designed effluent release structure can be operated at the Kalama site without creating temperature changes outside of this value downstream from the city of Kalama. (Upadhaya-Vanderbit) W73-01721

THERMAL EFFECTS OF PROJECTED POWER GROWTH: MISSOURI RIVER BASIN, Hanford Engineering Development Lab., Richland, Wash.

D. E. Peterson, and P. M. Schrotke.
Available from the National Technical Information Service as HEDL-TME-71-180, \$3.00 in paper copy, \$0.95 in microfiche. Publication HEDL-TME 71-180, September 1971. 65 p, 23 fig, 18 tab, 23 ref. AEC AT (45-1)-2170.

Descriptors: "Temperature, "Heat, "Missouri River, Cooling, "Thermal pollution, Thermal powerplants, Rivers, Environmental effects, Elec-tric power demand, Electric power production, Possil fuels, Nuclear powerplants. Identifiers: "Cooling capacity, "Thermal efficien-cy, "Waste heat, Kansas River, Yellowstone River.

Direct cooling capacities of the Missouri River and five tributaries downstream of Toston, Montana, a distance of 2290 river miles, were calculated for average and low flow conditions. Total assimilative and dissipative capacity ranged from a high of 300 GW sub T to a low of 159 GW sub T. At the 1969 average flow-through thermal rejection ratio (MW sub T/MW sub e) of approximately 1.7 for the Missouri Basin, the upper limit for direct cooled electrical generation would be 95 GWe at a 100% capacity factor and under low monthly conditions. Improvements in thermal efficiency may increase this limit to 110 GWe by 1990. Analyses of projected power generation patterns indicate increase this limit to 110 GWe by 1990. Analyses of projected power generation patterns indicate that the main stem Missouri has adequate cooling capacity to accommodate forecasted loads through the year 1990. Variable cycle or closed cycle cooling can be expected to be standard for 1980 and 1990 generating units using tributary streams as a source of condensing water supply, with the exception of the lower Yellowstone River. Regional planning of thermal releases will be especially important in the Omaha and Kansas City areas if flow-through cooling is to be utilized for 1990 requirements. (Oleszkiewicz-Vanderbilt) W73-01724

Group 5B-Sources of Pollution

HEAVY METALS-AN INVENTORY OF EXIST-

HEAVY METALD-AN THE BURG CONDITIONS, Virginia Inst. of Marine Science, Gloucester Point. M. E. Bender, R. J. Huggett, and H. D. Slone. Journal of the Washington Academy of Sciences, Vol 62, No 2, p 144-153, June 1972. 9 fig, 5 ref.

Descriptors: Water pollution, "Heavy metals, "Mercury, "Chesapeake Bay, Water pollution effects, "Virginia, Zinc, Cadmium, Copper, Cysters, "Estuaries, Bays, Environmental effects, "Path of pollutants.

Studies were undertaken to: establish mercury levels in biota and sediments from the lower portion of Chesapeake Bay: describe the pattern of metal distribution in cysters from 3 Virginia estuaries; and determine if estuarine sediments can be used to detect the effects of man's activities on the Bay area show no levels in excess of FDA guidelines, nor show any influence of man's activities. Oysters vary naturally in their body burdens of copper, cadmium, and zinc. Techniques are suggested whereby unnatural heavy metal inputs can be identified. Sediments from an industrialized river system reflect the inputs from human activities. (Knapp-USGS)

CONTRIBUTION OF SCAVENGED SULFUR DIOXIDE TO THE SULFATE CONTENT OF RAIN WATER, Pennsylvania State Univ., University Park. Dept. of Meteorology. J. M. Miller, and R. G. de Penna. Journal of Geophysical Research, Vol 77, No 30, p 5905-5916, October 20, 1972. 12 fig, 3 tab, 24 ref. NSF Grant GA-3956.

Descriptors: *Sulfates, *Fallout, *Rainfall, *Rain water, *Sulfur compounds, Path of pollutants, Air pollution, Water pollution, Water pollution sources, Clouds, Water chemistry, Water quality. Identifiers: *Sulfur dioxide.

The rate of formation of sulfate ion in raindrop size distilled water drops was measured for partial pressures of SO2 ranging from 0.00001 to 0.004 atm. A model was based on the results and on the assumption that the rate of formation of sulfate is determined by the rate of the first dissociation of sulfate outside to sulfate. The results of the model agree with published data for the rate of solution of SO2. with published data for the rate of solution of SO2 at low partial pressures The model was applied to rainout and washout of SO2 by cloud and raindrops. The contribution of the sulfate formed by gaseous absorption to the sulfate content of rain water was calculated. This contribution is important in polluted areas, although it is not predominant. Fog droplets, after absorbing SO2 in relatively polluted areas, produce particles of cloud nucleus size by evaporation. (Knapp-USGS) W73-01749

COMPUTER SIMULATION MODEL OF DYNAMIC BIO-PHYSICO-CHEMICAL PROCESSES IN SOILS, Arizona Univ., Tucson. Dept. of Soils, Water and

Engineering.
G. R. Dutt, M. J. Shaffer, and W. J. Moore.
University of Arizona, Agricultural Experiment
Station, Technical Bulletin 196, October 1972, 101
p. 23 fig. 50 tab, 1 FORTRAN computer program,
60 ref.

Descriptors: "Soil water movement, "Water pollution sources, "Water quality, "Model studies, "Nitrogen, "Microbiology, Systems analysis, Fertility, Computer models, Computer programs, Forecasting, Environment, Management, Soilwater-plant relationships, Irrigation, Simulation analysis, Infiltration, Evapotranspiration, Ion exchange, Solubility, Nitrogea compounds, Calcium, Magnesium, Sodium, Ammonia, Sulfates,

Bicarbonates, Chlorides, Carbonates, Nitrates, Gypsum, Lime, Organic matter.

Gypsum, Lime, Organic matter.

Current utilization of water resources, degradation of water supplies and increased public awareness of water quality problems require studies on the prediction of the effect of irrigated agriculture on water quality. Conceptual digital computer models of the dynamic soil-water system are useful to estimate salt concentration in drainage effluent, and impact of irrigation on water quality. A digital computer model simulates the effect of certain environmental and managerial factors on soil-water-plant systems. The model simulates monsteady state chemical, physical and biological changes in the unsaturated soil matrix and percolating water. Processes considered are infiltration and redistribution of soil water, evapotranspiration, nitrogen transformation, changes in solute concentration of soil water due to ion exchange, and nitrogen uptake by crops. The verified model predicts the time distribution and concentration of CA, MG, NA, NH4, SO4, HCO3, CL, CO3, NO3, CASO4-2, HZO, CACO3, CO (NH2)2, and organic N. A management example is included. (Popkin-Arizona)

ENTERIC BACTERIAL DEGRADATION OF

STREAM DETRITUS, Georgia Univ., Athens. Dept. of Microbiology For primary bibliographic entry see Field 05C. W73-01783

MICROBIOLOGICAL STUDIES ON NITROGEN FIXATION IN AQUATIC ENVIRONMENTS: V. MODIFICATION OF ACETYLENE METHOD FOR THE MEASUREMENT OF IN SITU RATE OF NITROGEN FIXATION, Mie Prefectural Univ., Tsu (Japan). Faculty of

Isao Sugahara, and Akira Kawai. Bull Jap Soc Sci Fish. Vol 37, No 11, p 1088-1092. 1971. Illus.

1971. Luus. (Identifiers: *Acetylene method, Chromatography, *Nitrogen fixation, *Gas chromatography, Mea-surements, Microbiological studies, Aquatic en-

For the purpose of estimating the in situ rate of N fixation which proceeds in aquatic environments, some modification was made in the acetylene reduction method. The analysis of ethylene formed from acetylene was carried out by a gas chromatograph which was equipped with a H flame ionization detector and a column (750 x 3 mm, 100C) of activated charcoal coated with 1.5% aqualane. N was used as carrier gas at a flow rate of 100 mL/min. The procedure for the in situ measurement of acetylene reduction was as follows: A glass bottle [150 mL] fitted with a rubber stopper and a stop cock was used for the reaction vessel. glass bottle (150 mL) fitted with a rubber stopper and a stop cock was used for the reaction vessel. After incubating the bottle containing the water sample and the gas mixture of acetylene, Ar and O2 at the in situ position of the sample for 30 or 60 min, ethylene produced in the bottle was absorbed into a solution of mercuric perchlorate using the ethylene trapping system.—Copyright 1972, Biological Abstracts, Inc. W73.01857

ECOSYSTEM PROCESSES IN A STAND OF ULEX EUROPAEUS L.: II. THE CYCLING OF CHEMICAL ELEMENTS IN THE ECOSYSTEM, tioner for Economic Develore and Natural Resources,

Commissioner for Economic Development, Agriculture and Natural Resources, Ibadan (Nigeria).
J. K. Egunjobi.
J Ecol. Vol 59, No 3, p 669-678. 1971.
Identifiers: Cycling, Ecosystem, Litter, Precipitation, Throughfall, *Ulex-Europaeus-D, Vegetation, *Trace elements, *Purze, Gorse ecosystem.

The quantities of chemical elements in the gorse ecosystem were determined. The vegetation plus litter contained the following amounts of macroelements in kg/ha: N, 874; P, 32.0; S, 67.4; Ca., 206.5; Mg, 117.8; K, 306.1; Na, 36.6; and the following quantities of micro-elements in kg/ha: Al, 53.; Re, 112.; Sr. 4.3; Ti, 3.0; Mn, 2.9; Ba, 0.9; Ni, 0.45; Cr, 0.06; Mo, 0.02. The average annual litter fall of 8800 kg/ha contained the following amounts of macro-elements in kg/ha: N, 157.8; P, 44; S, 16; Ca, 50; Mg, 21; K, 13; Na, 4; Si, 70; and the following amounts of micro-elements in kg/ha: Al, 7.5; Fe, 1.4; Mn, 0.7; Sr, 0.4; Ti, 0.3; Ba, 0.08; Cu, 0.05; Ni, 0.01; Cr, 0.007; and Mo, 0.0012. The quantities of elements contained in the average annual throughfall were, in kg/ha: Cl, 145; Na, 70; K, 16; Ca, 14; Mg, 13; N, 8; and P, 0.23. Al, Accession of elements in the annual precipitation of 1519 mm were, in kg/ha: Cl, 100; Na, 60; Ca, 10.7; K, 10; Mg, 5.3; and P, 0.22. By combining the various measurements, annual estimates of uptake, retention, release and input of elements in the coxystem were made. Over 65% of the Ca, S, Mg, Na and N, and 56 and 54% of K and P, respectively, estimated as taken up, were returned to the soil in the litter and recretion. Except for K and Na, a high proportion of these elements was returned in the litter. Similar estimates amount uptake was returned in the litter. With the exception of Na, the quantities of elements added to the coxystem were generally less than those removed from the cycle by immobilization in the plant. A balance were generally less than those removed from the cycle by immobilization in the plant. A balance sheet of the movement of chemical elements for the ecosystem could not be made since losses due to run-off and leaching were not estimated.—Copyright 1972, Biological Abstracts, Inc. W73-01866

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THE CONTENT OF COPPER, ZINC, AND MAN-GANESE IN THE WATER OF THE DAM RESERVOIR AT GOCZALKOWICE AND OF SEVERAL OTHER RESERVOIRS, sh Academy of Sciences, Krakow. Zaklad

Acta Hydrobiol. Vol 13, No 2, p 159-177. 1971. Il-

Identifiers: *Copper, Dams, Goczalkowice, *Mar ganese, *Poland, Pollution, Reservoirs, *Zinc.

The content of Cu, Zn, and Mn was determ the water of various zones of the reservoir at Goc-zalkowice, of the river Vistula supplying it, and in the outlet waters. For comparison, the concentra-tion of these microelements was also determined tion of these microelements was also determined in waters of 7 other dam reservoirs (pure and polluted). The content of all the investigated elements in the Goczalkowice reservoir was higher than in the pure Carpathian reservoirs, showing a distinct horizontal, vertical, and seasonal differentiation. The seasonal variability of these elements depended to some extent on the meteorological conditions of the surrounding terrain. None of these differentiations showed any distinct relationship with the other simultaneously determined chemical properties of the water. The inflow of microcomponents into the reservoir was greater properties of the water. The inflow of microcomponents into the reservoir was greater than their outflow. Mineral pollution had the greatest effect on the content of microelements.—Copyright 1972, Biological Abstracts, Inc. W73-01876.

FACTORS IN THE MOLYBDENUM AND PHOSPHORUS STATUS OF SOILS ON THE DORRIGO PLATEAU OF NEW SOUTH WALES, Commonwealth Scientific and Industrial Research Organization, Wembley (Australia). Div. of Plant ary bibliographic entry see Field 02G.

PCB AND OTHER INDUSTRIAL HALOGENATED HYDROCARBONS IN THE ENVIRONMENT, Fisheries Research Board of Canada, St. Andrews (New Brunswick). V. Zitko, and P. M. K. Choi. Technical Report No 272, 1971. 64 p, 9 fig, 9 tab, 181 ref, append.

Descriptors: "Polychlorinated biphenyls, "Aroclors, "Organic compounds, "Pesticide residues, "Reviews, Water pollution effects, Water pollution sources, "Gas chromatography, Analytical techniques, Halogens, Solvents, Fumigants, Aerosols, DDE, Atlantic salmon, Gulls, Birds, Shore birds, Water birds, Chlorinated hydrocarbon pesticides. Identifiers: "Polychlorinated terphenyls, Naphthalene, Chlorinated hydrocarbons, Parafins, Benzene, Biphenyls, Carboxylic acids, Refrigerants, Flame retardants, Propellants, Tuna, Bluefish, Swordfish, Marlin, Cod, Hake, Plaice, Redfish, Cormorants, Ducks, Guillemot.

Redfish, Cormorants, Ducks, Guillemot.

Industrial applications of polychlorinated biphenyls (PCB), chlorinated naphthalenes, chlorinated paraffins, chlorinated benzenes, polybrominated biphenyls, chlorinated benzenes, polybrominated biphenyls, chlorinated benzenes, polybrominated biphenyls, chloro-hydroxy biphenyls, and halogenated carboxylic acids are described. A list of other halogenated hydrocarbons and derivatives, used as solvents, fumigants, refrigerants, flame retardants, acrosol propellants, heat-transfer media, hydraulic fluids, etc., is included. Current methods for the measurement of PCB are reviewed. PCB and p.p.-DDE levels in fishes and aquatic birds, reported in the literature, are summarized. Recently determined PCB concentrations in Atlantic salmon, bluefin, yellowfin, and skipjack tuna, bluefish, swordfish, and blue marlin, cod, white hake, plaice, and redfish, double-crested cormorant, herring gall, black duck, and guillemot are presented. The determination of polychlorinated terphenyls (PCT) in biological samples and the behavior of polybrominated biphenyls and polychlorinated dibenzo-p-dioxans and dibenzofurans during cleanup and gas chromatography are described. Biological effects of PCB and other halogenated hydrocarbons are reviewed. The sources of PCB leakage into the environment and their circulation are discussed. Analytical procedures for the determination of PCB and organochlorine pesticides based on the modified cleanup chromatography of Holden and Marsden are described. (LeGore-Washington)

WATER POLLUTION BY OUTBOARD MOTORS AND ITS EFFECTS ON FAUNA AND FLORA (GEWAESSERVERSCHMUTZUNG DURCH AUSSENBORDMOTOREN UND DEREN WIRKUNG AUF FAUNA UND FLORA), Bundesgesundheitsamt, Berlin (West Germany). Institut fuer Wasser-, Boden-, und Lufthygiene.

D. Ludemann.

Helgolaender wissenschaftliche Meeresunter-suchung, Vol 17, p 356-369, 1968. 6 fig. 1 tab, 6 ref.

Descriptors: "Water pollution effects, "Oily water, "Organic compounds, "Phenols, "Oil pollution, Water quality, Fish, "Fish food organisms, Water pollution sources, Chemical wastes, Gasoline, Oil wastes, Fuel, Bioassay, Lethal limit, Toxicity, Carp, Trout, Bioindicators, Taste. Identifiers: Exhausts, Combustion products.

Motor brake tests, tank tests, and tests in ponds were conducted to consider the effects of dissolved engine gases on fishes and fish food organisms in relation to fuel consumption and test duration. Tests were made with 3 new, mixed-lubricated twostroke carburetor engines with underwater exhausts and a capacity of 6, 20, and 40 PS, respectively, releasing a drift of oil, as well as petrol and its combustion products. Of special interest were hydrocarbons because of their poor biochemical decomposition in organisms and

phenois in view of their toxicity in water. Lethal dones differed in fishes (carp, trout) tested. During pond tests these fish turned out to be sensitive indicators for the degree of water pollution because accumulation of combustion products in the water can be tested very quickly in terms of fish flesh flavor. Experiments in aquaria demonstrated that detrimental changes in the flavor of the flesh disappeared after some days exposure to clean water. The pond experiments revealed a significant reduction in the number of certain microorganisms. After termination of tests, the chemical and biological conditions improved increasingly within a few weeks due to self-purification of the water. Investigations show that, in waters serving as drinking water supplies, all boat activities must be avoided. (Sveasson-Washington)

EXAMINATION OF BOTTOM DEPOSITS, LONG HARBOUR, NEWFOUNDLAND, FOR ELEMENTAL PHOSPHOROUS AND FOR FILUORIDES, Fisheries Research Board of Canada, Halifax (Nova Scotia), Halifax Lab.

R. G. Ackman, R. F. Addison, P. J. Ke, and J. C. Singer.

Sipos. Technical Report No. 233, 1971. 19 p, 13 fig, 9 ref.

Descriptors: *Phosphorous, *Water pollution sources, *On-site data collections, *Flourides, *Bottom sediments, Water pollution, Chemical wastes, Industrial wastes, Chemical analysis, Sediments, Cores, Effluents, Waste water disposal, Waste water (Follution), Fishkill, Methodology, Analytical techniques, Canada. Identifiers: *Long Harbour (Newfoundland).

In 1968 a fishkill occurred in Long Harbour, New-foundland. It was eventually determined to have been caused by an accidental spill of elemental phosphorous. Samples of harbour bottom deposits were collected by divers using cores and buckets, and were analyzed for elemental phosphorous and total floride. Results of work carried out from May, 1969 to (April, 1970 are summarized. (LeGore-Washington) W73-01901

NATIONAL CENTER FOR TOXICOLOGICAL NATIONAL CENTER FOR TOXICOLOGICAL RESEARCH, FINE BLUFF, ARKANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT). Department of Health, Education and Welfare, Washington, D.C. For primary bibliographic entry see Field 05C. W73-01918

5C. Effects of Pollution

FACTORS INFLUENCING LOCAL DISTRIBU-TION OF CYPRINODON VARIEGATUS (PISCES: CYPRINODONTIDAE), Puerto Rico Nuclear Center, Rio Piedras. (PISCES: CYPRINODONTIDAE),
Puerto Rico Nuclear Center, Rio Piedras.
Radioecology Div.
F. Douglas Martin.
Trans Am Fish Soc. 101 (1): p 89-93, 1972.
Identifiers: "Cyprinodon-Variegatus,
"Cyprinodontidae, "Distribution patterns, Pisces,
Water pollution effects, Chemical factors.

Local distribution of C. variegatus Lacepede was examined with special emphasis on entrance into freshwater. One hundred and twenty localities were examined in relationship to fish faunas and water chemistry. The chemical factors examined were Ca, Mg, Na, K, chloride, alkalinity and dissolved O2. These factors singly or in combination had little effect on local distribution. Primary freshwater fish and especially centrarchid fishes seem to exclude Cyprinodon with the mechanism for this exclusion appearing to be competition for some resource (s).—Copyright 1972, Biological Abstracts, Inc.
W73-01323

THE ACCUMULATION AND SIGNIFICANCE OF SLUDGE NEAR SAN DIEGO OUTFALL, Water Resources Engineers, Inc., Walnut Creek, Calif. For primary bibliographic entry see Field 05B. W73-01344

EFFECTS OF BENTHAL DEPOSITS ON OXYGEN RESOURCES OF NATURAL STREAMS, New York Univ., N.Y. School of Engineering

Science.
J. A. Oguarrombi.
Available from University Microfilms, Ann Arbor, Michigan, Order No 69-4572, Xerox Copy.
Sc. 20, Microfilm \$3.00. Ph. D. Dissertation, 1968.
128 p.

Descriptors: "Biochemical oxygen demand, "Dis-solved oxygen, Sludge, Chemical oxygen demand, Aerobic conditions, Self purification, Organic matter.
Identifiers: *Benthal deposits.

Identifiers: "Benthal deposits.

Benthal deposits in a stream, lake, or estuary exert oxygen demands on water by two distinct processes, it was found: (a) the addition of organic matter exerts a BOD; and (b) demand for DO to satisfy BOD within the aerobic layer and the COD of the end-products of anaerobic composition which diffuse to the aerobic zone from deeper layers. Experimental work verified the relative magnitudes of the parameters of the processes. The results generally indicate that the rate of transfer of organic matter from the benthal deposit to the supernatant water. LA (mg/l per day), is smaller than the rate at which dissolved oxygen is being abstracted from the supernatant water by the deposit, DB (mg/l per day). On the average, LA was found to be about 28% of DB. Moreover, for any sludge deepth, the total oxygen demand of the deposit is less than the potential aerobic demand of the sludge. (Anderson-Texas)

EFFECT OF NITROGEN COMPOUNDS IN WELL WATER ON A CHILD,
Polskie Towarzystwo Pediatryczne, Warsaw (Po-

land)

land).
Jerzy Gasinski.
Pediatr Pol. 46 (1): 91-94. 1971.
Identifiers: Children, *Globinemia, Nitrates,
Nitrites, *Nitrogen compounds, Water pollution
effects, *Well water.

Nitrates received orally by the human are reduced through the action of intestinal flora to nitrites and these in turn are resorbed into the bloodstream. A level of nitrates in potable water above 20 mg/l NNO3 may cause methemoglobinemia with symptoms of cyanosis, dizziness, headache, diarrhea or anemia. Infants are most prone to the affliction, which is rather frequent among rural population with water supplies from wells. The standard of 50 mg/l NNO3 established by the WHO is too high with respect to small children.—Copyright 1972, Biological Abstracts, Inc. W73-01372

IME LIFE HISTORY AND POPULATION DYNAMICS OF CYCLOPS SCUTIFER SARS IN PEDRO BAY, ILIAMNA LAKE, ALASKA, Washington Univ., Seattle. B. Gunnerod.

B. Gunnerod. Available from Univ. Microfilms, Inc., Ann Arbor, Mich., 48106, Order No. 71-28,413. Ph D. Thesis, 1971, 148 p.

Descriptors: "Copepods, "Life cycles, Sockeye salmon, Food chains, Aquatic animals, Growth stages, Fecuadity, Mortality, Eggs, Growth rates, Reproduction, "Alaska, Primary productivity, Zooplankton, Plankton. Identifiers: "Cyclops scutifer, "Pedro Bay (Alas), "Ilianma Lake (Alas).

Group 5C-Effects of Pollution

Cyclops acutifer is the major zooplankton and food item of juvenile sockeye salmon in Iliamna Lake. To determine its life cycle, vertical distribution, fecundity, and daily birth and death rates, a study was conducted on Pedro Bay from mid-June to mid September, 1967-69. Sediments and the limnetic zooplankton were sampled by various mesh plankton nets. It was found that Cyclops scutifer can complete its life cycle in one but normally in two years. The development through the three copepodid stages appears greatly dependent upon seasonal temperature changes. Average egg carrying counts decreased from 40 to 20 from early June to early September, and average total leagth decreased by 11-12 percent. Egg numbers were correlated to the number of phytoplankton cells per liter of water. Shortage of food appears to be responsible for decreases in fecundity and the retardation of development. Birth-death rates reached maximum by mid-July, 1968. A possible relationship between Cyclops scutifer life cycles and its reproductive rate and the cyclic abundance of sockeye salmon in the Kvichak system is discussed. (Mackan-Battelle)

THE ECOLOGY OF SHALLOW WATER DEPOSIT FEEDING COMMUNITIES, Yale Univ., New Haven, Conn.

Yane Univ., New Hardes, J. S. Liviation. Available from Univ. Microfilms Inc., Ann Arbor, Mich., 48106 Order No. 71-28,907. Ph. D. Thesis, 1971, 345 p.

Descriptors: *Shallow water, *Biological commu-nities, Habitats, Deep water, Channels, Aquatic animals, Harbors, Ecological distribution, Niches, *Massachusetts. Identifiers: *Macrofauna, Deposit feeders, Suspension feeders, *Quisset Harbor (Mass), Eel grass, Macroinvertebrates, Channel communities.

grass, Macroinvertebrates, Channel communities.

Two communities of deposit-feeding macrofauna waver investigated: a shallow (1-4 m) eel grass muddy sand community, and a deeper water (4-7 m) sandy mud channel community. These communities of Quisset Harborn, Massachusetts were studied through bottom sampling and laboratory studies. Biogenic reworking of the substratum is important in determining distribution and abundance. Substratum modification and physical displacement of sediment cause interference between different deposit-feeding species. Distribution and abundance suggest that the species are resource limited and competition is important in microhabitat control. Stability of food supply enables competition to enforce selection for habitat specialization or to enable competitive exclusion. It is suggested that the great variability in predictability of food for suspension feeders tend to prohibit the evolution of stable systems of species that show niche relations. (Mackan-Battelle)

USING THE RESPIRATORY RESPONSES OF USING THE RESPIRATORY RESPONSES OF BLUEGILL SUPPISH (LEPOMIS MACHROCHIRUS RAFINESQUE) TO MONI-TOR ZINC CONCENTRATIONS IN WATER, Virginia Polytechnic Inst. and State Univ., Blacksburg. For primary bibliographic entry see Field 05A. W73-01429

L. PATTY ACID SYNTHESIS IN PSEU-DOMONAS FLUORESCENS. II. LIPID DEFI-CIENT MUTANTS OF ESCHERICHIA COLI, Harvard Univ., Cambridge, Mass. R. C. Essenberg. Available from Univ. Microfilms, Inc., Ann Ar-bor, Mich., 48106, Order No. 71-29,992. Ph. D. Thesis, 1971, 288 p.

Descriptors: *E. coli, Bioindicators, Enzymes, Aerobic bacteria, Pseudomonas, Distillation,

Proteins, *Lipids, Temperature, Lethal limits, Amino acids, Separation techniques, Analytical techniques, Organic acids, Inhibitors, Pathogenic bacteria, Antibiotics (Pesticides).

Identifiers: *Fatty acids, Biosynthesis, *Pseudomonas fluorescens, Acyl carrier protein, Synthetase, Acetyl CoA, Malonyl CoA, Mutants, Phosphatidyl glycerol, Chloramphenicol, Streptomycin, Beta-hydroxydecanoyl thioester dehydrase, Substrate utilization.

In the first of a two-part study, an enzyme system capable of forming fatty acids from acetyl CoA, malonyl CoA, NADPH and acyl carrier protein (ACP) was found in Pseudomonas fluorescens and partially purified by ammonium sulfate fractionation. The substrate requirements were similar to those of the fatty acid synthetase from E. coli, except that higher concentrations of acetyl and malonyl CoA are required. The synthetase ahowed cooperativity with ACP, the Hill coefficient being 2. Salt activated the system. Pseudomonas ACP is active in the E. coli synthetase, but shows a lower affinity than E. coli ACP. With E. coli ACP, the product spectrum of the Pseudomonas synthetase is shifted to shorter chain lengths, and production of unsaturated fatty acids is greatly depressed compared to the spectrum obtained with Pseudomonas ACP. In the second part of the study, a procedure for identifying conditional lethal mutants defective in lipid biosynthesis was developed and applied to a series of temperature sensitive mutants. Two were found to be defective in both lipid and protein synthesis. Analysis of the lipids produced showed all major classes to be equally affected in one mutant (S 11), while phosphatidy affected in one mutant store the reminents of the termine the onset of protein and lipid biosynthesis at 30 C following a period of heating at 42 C. (Mortland-Battelle) W73-01430

A STUDY OF THE RELATIONSHIP BETWEEN CHEMICAL WATER QUALITY AND FISH AND BENTHIC MACROINVERETEBRATE DIVERSITY IN FRENCH CREEK, CHESTER COUNTY, PENNSYLVANIA, Pennsylvania State Univ., University Park. R. D. Heister.
Available from Univ., Microfilms, Inc., Ann Arbor Mich., 48106, Order No. 71-28,695. Ph. D. Thesis, 1971. 109 p.

Descriptors: "Water quality, "Benthic fauna, "Fish, "Chemical properties, Invertebrates, Aquatic animals, Seasonal, Physicochemical properties, Dissolved oxygen, Biochemical oxygen demand, Conductivity, Alkalinity, Air temperature, Water temperature, Sampling, Coliforms, Nitrogen, "Pennsylvania, Nitrates, Phosphates, Nutrients, Ions, Hydrogen ion concentration, Equipment, Fish populations, Streptococcus, Standards, Water pollution effects, Water analysis, Bacteria.

sis, Bacteria.
Identifiers: "Macroinvertebrates, "Species diversity, "French Creek (Penn), Sampling gear, Fecal coliforms, Fecal streptococci, Most probable number test, Species diversity index.

Fish and benthic macroinvertebrate species diversity was related to the chemical features of French Creek, Chester County, Pennsylvania. Sampling was done throughout the length of the stream and was designed to include seasonal variations of chemical and biological features selected 24-hour chemical and biological features selected 24-hour observations of oxygen, specific conductance, pH, total alkalinity, air and water temperature, and type of substrate in the stream. Measurements of dissolved oxygen, biochemical oxygen demand, phosphate (ortho), nitrate as N, pH, specific conductance, and other ions were determined quarterly at all stations. A technique for sampling benthic macroinvertebrates utilizing a hand screen was used to capture the maximum number of species and individuals with a minimum of sampling. Three consecutive samples of fish were taken with electrofishing apparatus to obtain an estimate of the fish population and species diversity at each of four stations in August, 1969. Grab samples were collected to determine the total coliform M.P.N./100 ml, fecal coliform per 100 ml, and fecal streptococci per 100 ml. The biotic index and index of diversity related changes in the abundance and kinds of fish and benthic macroin-vertebrates to the degradation of water quality in the downstream stations and earichment throughout and there was a deterioration of water quality in the downstream stations and earichment throughout and there was an increase in mean conductivity, biochemical oxygen demand and nitrate values were higher than the permissible standards throughout the entire length of the stream. Biological indices for fish and benthic macroinvertebrates suggest that lower macroinvertebrates diversity results from prodation by a more diverse fish population. The coliform counts of this study are ranadequate in defining the quality of the water of French Creek. (Holoman-Battelle)

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THE EFFECTS OF THE SMITH MOUNTAIN PUMP STORAGE PROJECT ON THE FISHERY OF THE LOWER RESERVOIR, LEESVILLE, VIRGINIA, Virginia Polytechnic Inst. and State Univ., Blacksburg. R. D. Estes. Available from Univ. Microfilms, Inc., Ann Arbor Mich., 48106, Order No. 71-28,930. Ph. D. Thesis, 1971, 167 p.

Descriptors: "Reservoirs, "Fish, "Pumped storage, "Standing crop, "Environmental effects, "Fish populations, Water level fluctuations, Aquatic animals, Sunfishes, Bass, Hypolimnion, Water temperature, Growth rates, "Virginia, Spawning, Seasonal, Biomass, Secondary productivity, Water quality, Productivity, Identifiers: Micropterus salmoides, Lepomis macrochirus, "Leesville Reservoir (Va).

Identifiers: Micropterus salmoides, Lepomis macrochirus, "Leeville Reservoir (Va).

Studies were conducted on the effects of water level fluctuation and temperature on the growth and standing crops of fishes in a mainstream pump storage reservoir, Leeville, with emphasis on largemouth bass, Micropterus salmoides, and bluegill, Lepomis macrochirus. Water level in Leesville Reservoir fluctuated in response to the operation of Smith Mountain power plant. A weekly cycle was prevalent with the highest level occurring on Friday evening following 5 days of generation and the lowest on Monday morning following a weekend of pumping. Weekly changes in the water level of the magnitude of 6 to 8 ft were common and daily changes of 1 to 4 ft normally occurred. During the summer months water temperature in Leesville Reservoir fluctuated in response to the operation of the Smith Mountain plant. Normal patterns of temperature stratification were established in the lower third of the reservoir during the summer, and surface temperatures seldom exceeded 25 C. Population estimates made in 1968 and 1969 in conjunction with studies by the Virginia Commission of Game and Inland Fisheries, 1963-70, showed that standing crops of fishes for the creation of the first 2 or 3 years but declined later in life. Growth rate of bass was correlated with success of gizzard shad reproduction. Growth rate of bass was correlated with success of gizzard shad reproduction. Growth rate of bass was correlated with success of gizzard shad reproduction. Growth rate of bass was correlated with success of gizzard shad reproduction. Growth rate of bass was correlated with success of gizzard shad reproduction. Growth rate of bass or bluegill, but the effect of fluctuations did not directly affect spawning or growth of bass. Water temperatures appeared to suppress normal

bass spawning. Largemouth bass and bluegill have spawned every year since 1965, but since 1967 apawning was delayed until after mid-June. There was no direct adverse effect on the fish population of Leesville Reservoir that could be attributed to water level fluctuation or water temperature. W73-01433

RELATIONSHIP OF TRACE ELEMENTS TO ALGAE GROWTH, Washington State Univ., Pullman. J. Koelling. Available from Univ. Microfilms, Inc., Ann Ar-bor, Mich., 48106, Order No. 71-28,778. Ph. D. Thesis, 1971, 142 p.

Descriptors: *Algae, *Growth rates, *Primary productivity, *Heavy metals, *Trace elements, Nutrients, Mercury, Chromium, Cobalt, Fresh water, Lakes, Physical properties, Chemical properties, Gold, Iron, Cesium, Alkali metals, Seasonal, Zinc, Absorption, Light penetration, Alkalinty, Halogens, Hydrogen ion concentration, Phosphates, Nitrates, Dissolved oxygen, Temperature, Spectrometers, Toxicity, Diatoms, Chrysophyta, Cyanophyta, Metals, Irradiation, Automation, Eutrophication, Nuclear reactors, Computers, Data processing, "Washington, Sampling, Identifiers: *Williams Lake (Wash), Uranium, Thorium, Antimony, Macronutrients, Micronutrients, Scandium, Rubidium, Bromine, Actinides, Radioactive decay, Gamma-ray spectrometry, Counting.

Research directed toward finding correlations between algal populations and trace elements in a natural aquatic environment, Williams Lake (Washington), basically involved the identification and quantification of algal species as well as the measurement of some 14 trace elements present in the lake water. Eighty-two samples of water with algae were collected over a 13-month period to observe seasonal fluctuations in both algal species and trace elements. Collection was made in polyethylene bottles from three different depths at one location where the lake was the deepest. These samples along with appropriate standards were irradiated in the Washington State University Triga III research reactor for 12-15 hours. After a decay period of approximately 2 weeks, each sample and standard was counted on a Nuclear Data 2200 gamma-ray spectrometer system using a high resolution Ge (Li) detector for approximately 17 hours to determine trace element concentrations. Z200 gamma-ray spectrometer system using a high resolution fee (Li) detector for approximately 17 hours to determine trace element concentrations. Adjac cell identification and quantitative estimates were determined by a microscopic count. Data analysis and a linear correlation study between algal species and trace element concentration was performed utilizing an IBM 360/67 computer. Several physical and chemical measurements were also made including light transmission, alkalinity, acidity, pH, dissolved oxygen, temperature, phosphates, and nitrates. Results indicate that: (1) Uranium, thorium, and cesium may be present in excess of growth requirements or may possibly have no affect on the growth rate of any of the algal forms studied. (2) Mercury, although toxic in small quantities, may be utilized by diatoms in small quantities, may be utilized by diatoms in small quantities, may be utilized by diatoms. (4) Zinc and iron appear to be utilized by blue-green algae. (5) Uptake of scandium, rubidium, and bromine by algae is not apparent, but may be possible. (Holoman-Battelle)

LIMNOLOGICAL STUDIES ON BIGHORN LAKE (YELLOWTAIL DAM) AND ITS TRIBU-

TARIES,
Montana State Univ., Bozeman.
R. A. Soltero.
Available from Univ. Microfilms, Inc., Ann Arbor, Mich., 48106, Order No. 71-28,873. Ph. D.
Thesis, 1971, 290 p.

Descriptors: *Limnology, *Phytoplankton,
*Water analysis, *Standing crop, *Primary
productivity, Lakes, Sampling, Reservoirs, Tributaries, Dams, Chemical analysis, Biomass, Algae,
Physicochemical properties, Diatoms, Succession,
Nutrients, Rivers, Influent streams, Effluent
streams, Light intensity, Nitrogen, Chrysophyta,
Nitrates, Chlorophyll, Phosphates, Turbidity,
Conductivity, Oxygea, Hydrogen ion concentration, Temperature, Fresh water, Water quality,
Nutrients, *Montana.
Identifiers: *Bighorn Lake (Mont), Bighorn River,
Shoshone River, Yellowtail Dam, Fragilaria
crotonensis, Cryptomonas ovata, Stephanodiscus
miagarae, Asterionella formosa, Rhodomonas
lacustris, Counting, Orthophosphates,
Chlorophyll a.

acustris, Counting, Orthophosphates, Chlorophyll a.

The phytoplankton community of Bighorn Lake in relation to its physical and chemical environment was studied during 1968-70. Samples and in situ measurements were taken at six permanent sampling stations on the reservoir during 56 cruises. Characterization of the influent and effluent waters of the reservoir revealed that Bighorn Lake was fertilized by the Bighorn and Shoahone Rivers. The relationships of conductivity, turbidity, nitrogen, and phosphate to tributary discharge were examined. Under average conditions total visible light was reduced to I percent of surface inensity at a depth of approximately 10 meters nearthe dam, but only I meter at station 5 (80.5 km upstream from the dam). Results of chemical analyses showed Bighorn Lake to be predominantly a calcium-sodium-sulfate-bicarbonate water. Nitrate-nitrogen and orthophosphate as well as the other chemical constituents determined were relatively high and appeared not to be limiting. Standing crops of the phytoplankton taxa were determined by direct count. Fragilaria crotonensis, Cryptomonas ovata, Stephanodiscus niagarne and Asterionella formosa reached the largest standing crops according to absolute mean cell volumes, whereas Rhodomonas lacustris, Cryptomonas ovata, Asterionella formosa necell volumes, whereas Rhodomonas lacustris, Cryptomonas ovata, Asterionella formosa and Fragilaria crotonensis were more important on a presence basis. The mean total algal standing crops and mean chlorophyll to algal cells volume ratio was 3.4 micrograms chlorophyll to algal cells. A definite algal succession was observed for all three years. Net primary productivity was calculated and a mean for all stations showed a range of 0.51 g C/sq m/day -1.42 g C/sq m/day during 1968 and 1970, respectively. (Holoman-Battelle)

EFFECTS OF AMINO ACIDS ON THE MORPHOLOGY AND SURVIVAL OF MARINE AND TERRESTRIAL BACTERIA IN ARTIFICIAL SEA WATER, New York Univ., N.Y. S. B. Zimmerman.
Available from Univ. Microfilms, Inc., Ann Arbor, Mich., 48106 Order No. 72-3151. Ph. D. Thesis, 1971. 119 p.

Descriptors: "Amino acids, "Bacteria, "Longevi-ty, Marine bacteria, Soil bacteria, Sea water, En-vironmental effects, Chelation, Cations, Ecosystem, Water pollution effects. Identifiers: "Morphology, Survival, Halophilic

The presence of amino acids, either singly or in combination, induced morphological aberrations in normally rod-shaped marine and terrestrial bacteria in artificial sea water. The morphological effects observed were typical of those of bacterial cells with defective envelopes. Some of the affected cells were spherical, some were elliptical, and others demonstrated rounded protuberances along the length of rod-shaped cells. An increase in camotic fragility and a loss of viability of bacterial cells was also observed in the presence of amino

acids. Marine and halophilic bacteria were found to be more susceptible than terrestrial bacteria to loss of viability and of structural integrity in the presence of amino acids. Chelation of divalent cations in the cell walls was the apparent mode of action. In a marine ecosystem, the observed effects could lead to an increased survival of terrestrial polluting bacteria and to a decrease in viability of indigenous marine bacteria. (Holoman-Battelle) W73-01436

THE ECOLOGICAL ENERGIES OF GROWTH, RESPIRATION AND ASSIMILATION IN THE INTERTIDAL AMERICAN OYSTER, CRASSOS-

INTERTIDAL AMERICAN OYSTER, CRASSOS-TREA VIRGRINICA (GMELIN), South Carolina Univ., Columbia. R. F. Dame, Jr. Available from Univ. Microfilms, Jac., Ann Ar-bor, Mich., 48106, Order No. 71-28,898. Ph. D. Thesis, 1971. 107 p.

Descriptors: "Oysters, "Respiration, "Growth rates, "Ecosystems, "South Carolina, Estuaries, Seasonal, Salinity, Water temperature, Model studies, Biological samples, Reproduction, Foodhabits, Energy, Biomass, Summer, Winter, Oxween requirements.

ygen requirements.
Identifiers: Casostrea virginica, Bivalves, Barnacles, Brachidontes exustus, Cathamalus fragilis, Balanus oburneus, Balanus improvisus, Balanus amphitrite, Macroinvertebrates.

amphitrite, Macroinvertebrates.

The ecological energies of growth, respiration and assimilation are determined for the interticial American oyster, Crassostrea virginica in order to help determine the importance of oysters in an estuarine ecosystem, particularly the North Inlet Estuary, Georgetown, South Carolina. The instantaneous growth rates of marked oysters are determined from monthly measurements of the increase in whole weight of individuals. A hypothetical model is developed to account for the monthly variations in the instantaneous growth rate. Temperature is the most important variable influencing the instantaneous growth rate, but reproduction and food supply are also important effects. The increase in whole weight of intertidal oysters is related to cumulative day degrees, but a simple linear model does not explain seasonal variations in growth. The influences of water temperature and body size on respiration, as determined by oxygen consumption, are investigated in the laboratory using the Gilson and Winkler techniques. An oxygen consumption model is developed which utilizes temperature and body size. Q sub 10 values computed from oxygen consumption decrease with increasing body size and temperature. The growth and respiration energies are used to compute the assimilation energy for different size oysters for each month of the year. The assimilation energy shows seasonal trends with a maximum in summer and a minimum in winter. (Mortland-Battelle)

W73-01437

ECOLOGY OF THE DIATOM COMMUNITY OF THE UPPER EAST GALLATIN RIVER, MON-TANA WITH IN SITU EXPREMENTS ON THE EFFECT OF CURRENT VELOCITY ON FEA-TURES OF THE AUFWUCHS, Montana State Univ., Bozeman. L. L. Bahls.

L. L. Bans. Available from Univ. Microfilms, Inc., Ann Ar-bor, Mich., 48106, Order No. 71-28,855. Ph. D. Thesis, 1971. p 159.

Descriptors: *Diatoms, *Sewage effluents, *Velocity, *Currents (Water), *Periphyton, *Water pollution effects, *Montana, Rivers, Sewage, Water analysis, Phosphates, Ammonia, Chlorides, Fluorides, Nitrogen, Organic matter, Biomans, Chlorophyll, Ecology, Water quality. Identifiers: *East Gallatin River (Mont), Nitrzehia dissipata, Nitrzehia epiphytica, Nitrzehia spp, Orthophosphates, Chlorophyll a, Carotenoids, Sphaerotihus natans.

Group 5C-Effects of Pollution

Samples taken monthly in 1968 and 1969 from six stations on the East Gallatin River, Montana were analyzed for diatoms and water chemistry. One station was above and six below the effluent of the Bozeman Sewage Treatment Plant. Orthophosphate, ammonia, chloride, and fluoride were found to increase markedly below the effluent but, except for orthophosphate, they returned to pre-effluent levels within the study area. The most common diatom was Nitzschia dissipate except for the station immediately below the effluent, where Nitzschia epiphytica predominated. High concentrations of morganic nitrogen explains the abundance of Nitzschias pphytica predominated. High concentrations of morganic nitrogen explains the abundance of Nitzschias sphites placed above and below the effluent at measured current velocities for two-week periods were used to collect Aufwuchs for analysis of dry weight, biomass, chlorophyll and carotenoid absorbance, chlorophyll a weight, and relative species composition of the distom community. Aufwuchs dry weight, biomass, and chlorophyll a accumulation correlated negatively with current velocity although some enhancement of accrual was noted up to about 0.400 m/sec. Current was positively correlated with the biomass/dry weight ratio. The growth of Sphaerotilus natans below the effluent was selectively favored by higher velocities. (Mortland-Battelle)

THE ORGANIC GEOCHEMISTRY OF HYDROCARBONS IN COASTAL ENVIRON-MENTS, Texas Univ., Austin. For primary bibliographic entry see Field 05B. W73-01439

A FEASIBILITY STUDY OF A LABORATORY MODEL AS A RESEARCH TOOL FOR IM-POUNDMENT WATER QUALITY INVESTIGA-

TIONS, Oklahoma Univ., Norman. Por primary bibliographic entry see Field 05B. W73-01442

STRUCTURAL AND FUNCTIONAL ASPECTS OF A SUBLITTORAL COMMUNITY,

OF A SUBLATTORAL COMMUNITY, Georgia Univ., Athens. K. L. Smith, Jr. Available from Univ. Microfilms, Inc., Ann Ar-bor, Mich., 48106 Order No. 72-2547. Ph. D. Thes-is, 1971. p 194.

Descriptors: "Respiration, "Water temperature, "Biological communities, "Georgia, Sampling, Cores, Marine animals, Biomass, Distribution patterns, Sediments, Benthic fauna, Seasonal, Metabolism, Bacteria, Energy budget, Clams, Annelids, Water quality, Research equipment. Identifiers: "Polychaetes, "Cumaceans, "Lamelibranches, "Sapelo Island (Ga), Corer, Macrofauma, Spiophanes bombyx, Oxyurostylis smithi, Abra aequalis, Notomastus, Tellina texana, Callianasa, Pinnixa chaetopterana, Microphodis atra, Feeding patterns, Species diversity, USNEL Spade Corer.

Structural and functional aspects of a sublittoral community were examined off Sapelo Island, Georgia with special emphasis on the macro-infauna. Sampling occurred from July, 1969 to June, 1970 employing a USNEL Spade Corer as the principal sampling device. The macro-infauna consisted of 103 species representing ten phyla. Numerically dominant species included the polychaete Spiophanes bombyx, the cumacan Oxyurostylis smithi, and the lamellibranch Abra aequalis. Vertical distribution analysis of macro-infauna indicated that most species inhabit the surface sediments but several organisms burrow to depths exceeding 50 cm. The importance of this distribution to benthic studies is discussed. A significant decrease in species diversity was noted in

March corresponding to a maximum in numerical dominance. The importance of March data in the interpretation of community structure is reviewed. Total community respiration ranged from 53.7-22.7 ml oxygen/sq m/hr with an ansual volume of 676.681 loxygen/sq m/hr with an ansual volume of 676.685 loxygen/sq m/hr with an ansual volume of 676.685 loxygen/sq m/hr of the total community respiration, macrofaunal respiration represented 12.1 percent, bacterial (major functional component), 50.5 percent; and meiofaunal-microfaunal-microfloral, 37.4 percent. Sediment chemical oxidation was responsible for 2.8-8.5 ml oxygen/sq m/hr of the total oxygen uptake. A positive correlation was found between community respiration and water temperature. Functional dominance in macrofaunal species was analyzed seasonally and compared to structural dominance. Numerically dominant species was nalyzed seasonally and compared to structural dominance. Numerically dominant species generally had a similar metabolic ranking. Large, numerically rare species exhibited a correlation between functional and biomass ranking. Macrofaunal feeding types were relatively consistent seasonally. Only nine species indicated an alteration in autition. Potentially available food sources were examined in the sediment and water column revealing a large resource. Comparison of available food and macro-infaunal requirements indicated the energy source to be three to four orders of magnitude, Reasons for this discrepancy are discussed. (Mortland-Battelle) W73-01443

GROWTH AND PHOSPHATE REQUIREMENTS GROWTH AND PHOSPHATE REQUIREMENTS OF NITZSCHIA ACTINASTROIDES (LEMM.) V. GOOR IN BATCH AND CHEMOSTAT CULTURE UNDER PHOSPHATE LIMITATION, (WACHSTUM UND PHOSPHATBEDARF VON NITZSCHIA ACTINASTROIDES (LEMM.) V. GOOR IN STATISCHER UND HOMOKONTINUIERLICHER KULTUR UNTER PHOSPHATLIMITIRERUNG), Freiburg Univ. (West Germany). Limnologisches Institut

Archiv fur Hydrobiologie, Vol 38, No 4, p 399-484, March 1972. 43 fig, 14 tab, 158 ref.

Descriptors: "Nutrient requirements, "Limiting factors, "Phosphates, Diatoms, Pollutant identification, Growth rates, Deficient elements, Water pollution effects, Aquatic algae, Chrysophyta, Laboratory equipment, Freshwater, Water pollution sources, Instrumentation, Methodology, Nitrogen, Silicon, Absorption, Phytoplankton. Identifiers: "Nitzschia actinastroides, "Batch cultures, "Chemostats, Orthophosphates, Substrate utilization, Monod equation, Penicillia G, Terramycin, Chloramphenicol, Actidon, Culture media, Chlorophyll a, Teratology, Nitzschia.

Chlorophyll a, Teratology, Nitzschia.

The construction of a chemostat with a capacity of 2 or 4 1 is described. It was used to determine growth responses of the planktonic freshwater diatom Nitzschia actinastroides (Lemm.) v. Goor to limiting concentrations of orthophosphate. The maximal specific growth-rate was calculated from the data obtained in the chemostat at 23 C with continuous illumination. It is 0.087 hr and agrees well with the figure of 0.083 /hr obtained in batch cultures without substrate limitation. Monod's equation describes the correlation between growth rate and substrate concentration of phosphorus P sub 1 at medium and high growth-rates. The saturation constant lies between 0.40 and 0.44 microgram/l P sub 1. At medium growth-rates, the growth-limiting factor is the rate of P uptake, as is indicated by comparing uptake rates with the kinetics of P uptake in P-starved cells. The discrepancies observed at low growth rates are characterized by increasing P sub 1, high death rates, and high fractions of teratological cells. This indicates the appearance of factors other than phosphorus limiting growth. Threshold values of the dilution rate exist, below which the culture is washed out. They vary with conditions in the chemostat. The

contents in P and chlorophyll a of cells with P-limited growth are directly proportional to P sub l. P-storage in the cells occurs if growth is limited by factors other than P (e. g. C02). Therefore the yield coefficient is constant only if referred to the chlorophyll a produced. Referred to other reference figures, it decreases with increasing growth-rate and P-storage. The N-content of the cells increases with increasing growth rate and increasing growth rate and increasing growth rate and their transferability to natural conditions are discussed. (Long-Battelle) W73-01445

ECOLOGY OF A EUTROPHIC ENVIRON-MENT: MATHEMATICAL ANALYSIS OF DATA, (ECOLOGIE D'UN MILIEU EUTRO-PHIQUE: TRAITEMENT MATHEMATIQUE DES DONNEES). Centre Universitaire de Luminy, Marseille (France). Laboratoire d'Hydrobiologie Marine.

Descriptors: "Phytoplankton, "Statistical methods, "Zooplankton, "Biomass, "Sucession, "Isolation, Diatoms, Ecology, Salinity, Organic matter, Rivers, Estuarine environment, Water temperature, "Eutrophication, Aquatic life, Seston, Scenedeamus, Mathematical studies, Data collections, Marine animals, Primary productivity, Chlorophyll, Pigments, Magnesium compounds, Distribution patterns, Persistence, Water properties, Physical properties, Aquatic productivity, Marine algae, Salt tolerance, Correlation analysis, Chrysophyta, Chlorophyta, Fish eggs, Larvae, Crustaccans, Copepods, Phosphates, Nitrates. Identifiers: "Chlorophyll a, Data interpretation, Rhone River, Navicula, Melosira, Thalassiosira, Coscindiscus, Bacteriostrum, Leptocylindrus, Corycaeus, Oikopleura, Fritilliaria, Obelia, Cluster analysis, Multivariate analysis, Principal-component analysis, Part correlation, Decapods, Species diversity index.

Numerous data on physical, chemical and biological parameters in the dilution layer of the Rhone mouth have been studied by multivariate techniques: principal-component analysis, part correlation. A new technique of cluster analysis is also proposed. By these means, a very euryhaline group of zooplankton species has been isolated and the extremely low sensibility of phytoplankton towards, salinity has been shown. However, temperature seems to be the most important ecological factor. Instability and eutrophy of this area do not appear to disturb the phytoplankton cycle, which occurs with its usual successions. Chlorophyll a and organic matter do not seem of value for estimation of the biomass in the area studied. (Long-Battelle)

LIMNOLOGICAL LIMNOLOGICAL INVESTIGATIONS OF MOUNTAIN LAKE, GILES COUNTY, VIR-

MOUNTAIN LAKE, GILES COUNTY, VIRGINIA,
Virginia Polytechnic Inst., and State Univ.,
Blacksburg. E. K. Obeng-Asamoa.
Available from Univ. Microfilms, Inc., Ann Arbor, Mich., 48106 Order No. 71-31,029. Ph. D. Thesis, 1972. p 123.

Descriptors: "Limnology, "Lakes, "Primary productivity, "Nutrients, "Physicocchemical properties, Chlorophyta, Chlorophyll, Carbon radioisotopes, Carbon, Nitrogen, Water analysis, Phytoplankton, Dissolved oxygen, Nitrates, Nitrites, Phosphates, Ammonia, Chlorides, Sulfates, Iron, Oligotrophy, Silica, Diatoms, Chrysophyta, Organic matter, Chemical analysis, Sediments, Radioactivity techniques, Methodology, Protozoa, Sampling, "Virginia. Identifiers: "Mountain Lake (Va), Cyclotella comta, Sphaerocystis schroeteri, Planktosphaeria

gelatinosa, Perrous iron, Desmids, Ammonium, C-14. Microalgae.

getatnosa, Perrous fron, Desmas, Ammonium, C-14, Microalgae.

Mountain Lake (Virginia) was studied from January, 1970 through March, 1971 to obtain information on its trophic status. Included in the study was a correlation of the lake's physical and chemical parameters with the phytoplankton community and autrient regeneration of the sediment. The plot of Mountain Lake's water ranged between 5.9 and 7.2. Ammonium, nitrite, nitrate, phosphates, dissolved silica, chlorides, sulfates, and ferrous iron occurred in very low concentrations in the water. Dissolved oxygen curves for the summer were orthograde, and the hypolimentic oxygen never fell below 8.0 ppm. Areal oxygen deficit calculated for 163 days and 85 days were respectively 0.0019 and 0.0029 mg/sq mjday. These features all indicate oligotrophy. Phytoplankton populations were sparse and consisted of many species. Desmids dominated in summer, while the diatom, Cyclotella comta, dominated in winter and spring. Two chlorophycen algae, Sphaerocystis schroeteri and Planktosphaeria gelatinosa, occurred throughout the year. The winter flora also included small flagellates similar to the microalgae Rodhe (1955) described from the mountain lakes of the Swedish Lapland. Primary productivity studies, using chlorophyll, oxygen, and C-14 methods, yelded low values but showed highest productivity in the metalimnion which correlated with oxygen supersaturation there. Cyclotella cell counts and size-range, and the microalgae under the ice in winter, suggest high winter productivity which may be heterotrophic. Sediment core studies showed C/N to be well over 10, indicating that much of the sediment's organic material is allochthonous, and that the lake is polyhumous acceptation. dies showed C/N to be well over 10, moreung una-much of the sediment's organic material is al-lochthonous, and that the lake is polyhumous ac-cording to Hansen's classification. Chemical analyses of the interstital water at all depths of a analyses of the interstital water at all depths of a 30 cm core yielded concentrations of ammonium, nitrite, nitrate, phosphates, and silica significally above those in the water. A substantial oxidized microzone at the mud surface may precipitate these substances as oxidized complexes of iron, making them unavailable to the water above. (Holoman-Battelle)
W73-01447

ANNUAL ENERGY BUDGET OF A SMALL FOREST STREAM ECOSYSTEM: BEAR BROOK, WEST THORNTON, NEW BROOK, WEST THORN HAMPSHIRE, Dartmouth Coll., Hanover, N.H. S. G. Fisher.

Available from Univ., Microfilms, Inc., Ann Arbor, Mich., 48106 Order No. 71-30,159. Ph. D. Thesis, 1971. p 105.

Descriptors: *Energy budget, *Ecosystems, *Streams, *New Hampshire, Primary productivity, Forests, Watersheds (Divides), Mosses, Organic matter, Dissolved solids, Detritus, Respiration, Photosynthesis, Trophic level, Energy

transfer: *Bear Brook (N.H.), Allochthonons, Autochthonous, Particulate matter, Dissolved or-ganic matter.

An annual energy budget is presented for Bear Brook, a small undisturbed second order stream in northeastern U.S.A. The ecosystem approach, in which all input and output fluxes of potential energy as organic matter are considered, is used to describe the dynamics of energy flow in a 1700 m segment of the stream. The annual input of energy to the system is 603 Keal/square meter. Over 99 percent of this is allochthonous-from the surpercent of this is allochthonous-from the sur-rounding forested watershed or from upstream areas. Autochthonous primary production by mosses accounts for less than I percent of the total energy available to the ecosystem. Algae and vascular hydrophytes are absent from the stream. Meteorologic inputs (litter and through-fall) from the adjacent forest account for 44 percent of an-nual energy input. Most of this is in particulate form. The remaining 56 percent of input enters by geologic vectors (inflowing surface and subsurface waters). Eighty-three percent of the geologic input and 47 percent of the total input of energy occurs as dissolved organic matter. Approximately 4724 Kcal/square meter of organic detritus, nearly equally divided between leaves and branches, is stored within the system. Bear Brook is a strongly heterotrophic steady-state system in which import and export of organic matter play a very significant role. A conceptual scheme is presented by which import, export, photosynthesis, and respiration can be used to describe the functional dynamics and developmental processes of ecosystems. (Mortland-Battelle)

THE SPECIES COMPOSITION, SEASONAL SUCCESSION, REPRODUCTION AND DISTRIBUTION OF MARINE ALGAE FROM SCITUATE TO WOODS HOLE, MASACHUSETTS, New Hampshire Univ., Durham.

New Hamps D. C. Colema

D. C. Coleman. Available from Univ. Microfilms, Inc., Ann Ar-bor, Mich., 48106 Order No. 72-3735. Ph. D. Thes-is, 1971. p 143.

Descriptors: *Seasonal, *Distribution patterns, *Massachusetts, Systematics, *Reproduction, Rhodophyta, Phaeophyta, Water quality, *Marine

algae. Identifiers: *Cape Cod Canal (Mass), Buzzards Bay, Cape Cod Bay, Data interpretation, Species diversity.

Bimonthly collections were made from January to December, 1969 and total of 106 species was recorded. Conspicuous differences in species numbers were evident at each station. Scituate and Woods Hole had the highest numbers, while intermediate values were recorded in the Cape Cod Canal. Most of the species at Scituate and in the Canal were perennials; annuals were most abundant at Wings Neck and Woods Hole. The Rhodophyceae accounted for most of the spring and summer annuals, while the browns were the major contributors of winter annuals. Spring and and summer annuals, while the flowns were the major contributors of winter annuals. Spring and early summer annuals appeared several weeks so-oner at Wings Neck and Woods Hole than at Scituate. Some species appeared as spring annuals south at case after species appeared as spring annuals south of the Cape, but as summer annuals at Scituate. Some species reproduced throughout the year, while others were restricted to either warm or cold while others were restricted to either warm or cold seasons. Most species at Scituate were found in the intertidal and/or subtidal zone (s), while those at all other stations were collected primarily in the subtidal zone. Numerous factors are responsible for the vertical displacement of species recorded. An interpretation of the distributional patterns is given. (Mortland-Battelle) W73-01449

THE PHYSIOLOGICAL ECOLOGY OF PORIFERA: A COMPARATIVE STUDY OF THREE SPECIES OF TROPICAL MARINE DEMOSPONGIAE, Yale Univ., New Haven, Conn.

Yane Umv., New Haven, Committee, Children, Children, Children, Children, Children, Mich., Ann Arbor, Mich., 48106 Order No. 71-31,102. Ph. D. Thesis, 1971. p 240.

Descriptors: "Marine animals, "Physiological ecology, Scuba diving, Instrumentation, Feeding rates, Pamping, Respiration, Growth rates, Reproduction, Mortality, Metabolism, Symbioses, Aquatic habitats, On-site tests, Standing crop, Organic matter, Foods.
Identifiers: "Sponges, Porifera, "Demospongiae, "Mycale, "Verongia gigantea, "Tethya cripta, Feeding natterns.

*Mycale, *Vero Feeding patterns.

Field populations of three species of tropical Demospongiae (Mycale sp., Verongia gigantea,

Tethya crypta) were investigated in situ with the use of SCUBA and underwater recording instrumentation. During the 18-month study period major biological activities - including feeding, water pumping, respiration, growth, reproduction and mortality - of undisturbed specimens were quantitatively determined. The standing crop of local populations was determined in terms of wet volume, dry weight, ash-free dry weight and calories for whole specimens and morphological subfractions. Activity analyses obtained in a wide variety of indices for comparison of the three species are provided in tabular form. All three species are provided in tabular form. All three species exhibited a bimodal pattern of particle selection which appears to be common throughout and unique to the phylum Porifers. Bacteria were retained at rates near 95 percent by all three species, while larger armored plankton were retained at lower rates. Analysis of all data indicates that particulate organic matter supplies all energy requirements of Mycale, Tethya, and probably sponges in general. Dissolved organic matter is probably not directly available to sponges. The unique feeding pattern and high water pumping efficiency of sponges effectively has and will continue to insure partial freedom from competition from other suspension feeders. (Mortland-Battelle) telle) W73-01450

THE ACCUMULATION OF FREE FATTY THE ACCUMULATION OF FIRE PATTY ACIDS FROM SEA WATER BY MARINE IN-VERTEBRATES, California Univ., Irvine.
J. K. Testerman.
Available from Univ. Microfilms, Inc., Ann Arbor, Mich., 48106 Order No. 72-2254. Ph. D. Thes-

Descriptors: "Invertebrates, "Acids, "Adsorption, "Marine animals, Sea water, Lipids, Kinetics, Separation techniques, Worms cultures, Nutrient requirements, Radioactivity techniques, Carbon radioisotopes, Traces, Gas chromatography. Identifiers: "Fatty acids, Stearic acid, Oleic acid, Linoleic acid, Palmitic acid, Caproic acid, Acetic acid, Media, Stauronereis rudolfi (Della Chiaje), Chloroform extraction, Thin layer chromatography, Gas liquid chromatography, Medium, Polychaetes, Carbon-14, Stauronereis.

Uptake of stearic, oleic, linoleic, palmitic, caproic and acetic acids from sea water by a number of free-living marine invertebrates was investigated. Organisms were able to concentrate C14-labelled free-living marine invertebrates was investigated. Organisms were able to concentrate C14-labelled fatty acids by factors of up to 50-fold over the medium activity in an hour. The label was rapidly assimilated into a number of lipids and other biochemical compounds. Net accumulation was confirmed by monitoring the disappearance of unlabelled fatty acid from the medium. Rate of uptake was unaffected by antibiotics. Dead animals were unable to accumulate labelled fatty acids. Uptake kinetics were studied in detail using the polychaete Stauronereis rudolfi (Della Chiaje). Uptake was linear with time over the 3-hour incubation period studied, except for a rapid spurt in the first 3 minutes that was probably due to surface adsorption. Uptake takes place across the body wall by a mechanism showing 'asturation' kinetics and competitive inhibition. Chloroform extraction of dissolved lipids present in the natural environment of the worm, followed by thin-layer and gas-liquid chromatography, showed that free fatty acids are present in amounts of 51.4-63.7 micrograms C/liter, which is about one half the total dissolved neutral lipid material. The Michaelis-Menten constants derived from the kinetics experiments were used to calculate the velocities that the various fatty acids could be taken up at the environmental concentrations measured. It was estimated that fatty acid uptake probably could not supply more than a few percent of the reduced carbon required by the organism. (Mordland-Battelle)

Group 5C-Effects of Pollution

DYNAMICS OF BENTHIC FAUNA IN WATERS

DYNAMICS OF BENTHIC FAUNA IN WATERS OF NORTHERN MISSISSIPPI, Mississippi Univ., University. T. B. Millican. Available from Univ. Microfilms, Inc., Ann Ar-bor, Mich., 48106 Order No. 72-3930. Ph. D. Thes-

Descriptors: "Reservoirs, "Distribution patterns, "Mississippi, Ponds, Annelids, Mollusks, Biomass, Clams, Midges, Migration, Drawdown, Bottom sediments, Systematics, Crustaceans. Identifiers: Metazoa, Arthropods.

Identifiers: Metazoa, Arthropods.

The benthic fauna in the four flood control reservoirs of northern Mississippi was investigated over a two year period. A total of 34 regular stations, 17 transects, and six special stations was sampled in Arkabutha, Sardis, Enid, and Gernada Reservoirs and their tributaries. A total of five ponds was sampled concurrently at Minnows Incorporated, a minnow rearing facility located about 12 miles northeast of Oxford, Mississippi. These ponds were used as controls and compassion of effects caused by drawdown, exposure of bottom mud, predation by birds, and migratory attempts of certain benthic forms. Representatives of three major metazoan phyla, Arthropoda with the greatest occurrence, Anselida next in abundance, and Mollusca with the least occurrence, were obtained. These three phyla constituted 42 genera with 36 identified species and 14 of uncertain identification. Tables showing occurrence and distribution per square m of the domiof uncertain identification. Tables showing occurrence and distribution per square m of the domimant benthic forms are included in the report.
Graphs and histograms illustrate the total biomass
and emergence habits of the beathic organisms.
Sparueness of unionid clams and their migratory
attempts, habits of sphaeritic clams, contribution
of benthic fauna by tributaries, predation by birds
on certain other bottom forms, and emergence of
midges are discussed. (Mortland-Battelle)
W73-01452

THE BENTHIC MACROFAUNA OF GREEN BAY, LAKE MICHIGAN, Wisconsin Univ., Madison.

Whechand Oliv., manison.
R. P. Howmiller.
Available from Univ. Microfilms, Inc., Ann Arbor, Mich., 48106 Order No. 71-24,465. Ph. D. Theais, 1971. p 241.

Descriptors: *Benthic fauna, *Aquatic animals, *Distribution patterns, *Lake Michigan, *Bioindicators, Oligochaetes, Midges, Water pollution, Systematics, Fresh water, Invertebrates, Gastropods, Clams, Crustaceans, Amphipoda, Butrophicatioa, Lake Brie, Mayfies, Tubificids, Isopods, Sampling, Great Lakes, Oligotrophy, Water pollution effects.

Identifiers: *Green Bay (Wisc), Fox River, Benthic macrofauna, Leeches, Hirudinea, Hexagenia, Stylodrilus heringianus, Limmodrilus hoffmeisteri, Aulodrilus spp., Peloscolex spp., Potamothrix spp, Chironomus cf attenuatus, Chironomus cf plumosus, Procladius cf culiciformis, Tanytarsus spp, Heterotrissocladius cf subpilosus.

The macroscopic benthic invertebrates of Green Bay were studied from grab samples taken at 113 stations between 1966 and 1969. Comparison of the present findings with data from studies done in 1938-39 and 1952 indicates that many types of invertebrates are less abundant and widespread now than two or three decades ago. Except for a small area around the mouth of the Fox River, the major polluting inflow, Oligochaeta and Chironomidae are present in greater numbers than in earlier years. The observed changes are similar to those recorded for western Lake Erie and are indicative of increased eutrophication and pollution. Oligochaeta are the most abundant macroinvertebrates in the bay with thirty-one species recorded. Species distributional patterns, with respect to known environmental parameters, are similar to those found in other investigations in the

Great Lakes with Stylodrilus heringianus at the oligotrophic northern end of the bay, Limnodrilus holfmeisteri dominant in the polluted southern end, and Aulodrilus, Peloscolex and Potamothrix species reaching their greatest relative abundance in between. Twesty taxa of Chironomidae have been found. The dominant taxa in the lower and middle bay belong to genera (Chironomus, Procladius) commonly associated with eutrophic or polluted environments. The upper bay midge fauna is more diverse with some stations dominated by mesotrophic or oligotrophic forms (Tanytarsus, Heterotrissocladius cf. subpilosus). Further sampling, on a seasonal basi, is necessary to accurately determine the abundance and distributional patterns of the less numerous worm and midge species. (Holoman-Battelle)

THE INTERRELATIONSHIPS AMONG PLANK-TON, ATTACHED ALGAE AND THE PHOSPHORUS CYCLE IN ARTIFICIAL OPEN SYSTEMS, Toronto Univ. (Ontario).

J. L. Confer.

Available from Univ. Microfilms, Inc., Ann Ar-Available from Univ. Microfilms, 11 bor, Mich., 48106. Ph. D. Thesis, 1969

Descriptors: *Plankton, *Algae, *Sessile algae, *Cycling nutrients, Ecosystems, Phosphorus, Scenedesmus, Chlorophyta, Bacteria, Phosphorus radioisotopes, Inflow, Cyanophyta, Littoral, Nutrients, Model studies, Bioassay, Radioactivity techniques, Absorption.

Identifiers: *Phosphorus cycle, Gloeotricha, P-32.

The distribution and rates of circulation of phosphorus were studied in 200 liter microecosystems. The systems were maintained as open systems with a constant influx of water containing phosphorus. The effects of different inflowing phosphorus concentrations were determined. Filamentous algal growth attached to the sides of the tanks had a dominant influence on the phosphorus concentration in the open water. There was a negative correlation between the amount of algae attached to the sides and phosphorus concentration in the open water. The attached growth removed particles as small as bacteria and as large as Scenedesmus from the open water. The estimated rate of movement for various particles ranged from 14 to 385 percent per day. water. The estimated rate of movement for various particles ranged from 14 to 385 percent per day. When the inflowing water was earliched with phosphorus, the species composition of the littoral algae was changed. Blue-green algae, predominantly Glocotricha, replaced the green algal characteristic of unfertilized ponds. Phosphorus content of the open water was not increased by enrichment because the blue-green algae accumulated a larger fraction of the inflowing phosphorus than did the green algae. Results of experiments in which radioactive phosphorus was added to the open water were similar to those obtained previously in lakes. The kinetics of P-32 loss from the open water are theoretically compatible either open water were similar to those obtained previously in lakes. The kinetics of P-32 loss from the open water are theoretically compatible either with an equilibrium distribution between the open water and the attached algae or other littoral solids, or with a steady state system in which there is a net movement from the open water to the atis a net movement from the open water to the at-tached algae or littoral solids. (Holoman-Battelle) W73-01454

THE EFFECT OF X-IRRADIATION UNDER VARIOUS TEMPERATURE CONDITIONS AND EMBRYONIC DEVELOPMENTAL STAGES ON THE GROWTH AND MORTALITY OF CHIN-OOK SALMON, Washington Univ., Seattle. G. W. Wadley. Available from Univ. Microfilms, Inc., Ann Arbor, Mich., 48106 Order No. 71-28,488. Ph. D. Thesis, 1971. p 125.

Descriptors: *X-rays, *Chinook salmon, *Embryonic growth stage, Water temperature, Fish

eggs, Irradiation, Growth rates, *Growth stages, Lethal limit, Incubation, Bioassay, *Radioactivity effects, Water pollution effects. Identifiers: Lethal dosage.

Embryonic stages of chinook salmon were exposed to acute, graded doses of X-radiation. Prior to, during, and following irradiation the embryos were incubated at various temperatures and temperature regimes. Radiosensitivity of the embryos in terms of LD sub 50 generally decreased with age, but increases in temperature above ambient tended to decrease the LD sub 50 of embryos independent of the developmental stage irradiated. Sublethal doses of X-radiation significantly stimulated growth as measured by length and weight. Initiation of growth stimulation by X-radiation did not appear to be temperature dependent but a temperature-x dose interaction significantly influence the mechanism following initiation. This influence resulted, in general, in realization of growth stimulation from a lower dose when administered at an elevated temperature than at a lower temperature. The mechanism responsible for growth stimulation, even though initiated by X-radiation, appeared to be retarded by a constant temperature regime as compared to a temperature regime that followed the normal seasonal fluctuations. Pre-irradiation handling of eggs significantly increased mortality and retarded growth of survivors. The increase appeared to be independent of incubation temperature and could be correlated directly with periods of active differentiation of the embryo. Retardation of growth as a result of handling could also be correlated with active differentiation but, unlike mortality, was temperature dependent. (Mortland-Battelle)

FIELD ASSESSMENT OF N2-FIXATION BY LEGUMES AND BLUE-GREEN ALGAE WITH THE ACETYLENE REDUCTION TECHNIQUE, Wisconsin Univ., Madison.
T. H. Mague.
Available from Univ. Microfilms, Inc., Ann Arbor, Mich., 48106 Order No. 71-28,353. Ph.D. Thesis, 1971, 200 p.

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Descriptors: *Algae, *Legumes, *Nitrogen fixation, *Cyanophyta, Plants, Nitrogen, Reduction (Chemical), Gas chromatography, Separation techniques, *Wisconsin, Oligotrophy, Butrophication, Lake Superior, Lake Michigan, Lake Huron, Lake Erie, Great Lakes, Soybeans, Light intensity, Air temperature, Sampling, Aquatic algae, Phytoplankton, Trophic levels.

Identifiers: *Acetylene reduction, Rhizobium japonicum, Lake Mendota, Crystal Lake, Trout Lake, Big Arbor Vitae Lake, Little Arbor Vitae Lake, Green Bay, Fox River, Detroit River, Heterotrophic bacteria, Acetylene, Ethylene.

Heterotrophic bacteria, Acetylene, Ethylene.

Field studies of nitrogen-fixation, both in aquatic and terrestrial environments, utilized a procedure which consists of (1) exposing the test material (excised and intact soybean nodules and bluegreen algae) to approximately 0.1 atm. of acetylene in a closed system for 1/2 hour and (2) quantitating the resulting ethylene by flame ionization after its gas chromatographic separation from acetylene. The experiments with excised soybean nodules showed that acetylene reduction was linear for at least 30 minutes but was undetectable in the absence of oxygen. Twenty samplings from Lake Mendota (May-November, 1970) revealed two major peaks in blue-green algae N2-fixing activity, but no correlation between dissolved inorganic? or N concentrations and acetylene reduction rates for the same samples. Of the four Wisconsin lakes sampled, (Summer, 1970) Crystal and Trout Lakes (oligotrophic) supported little acetylene reduction and supported heavy blue-green algal blooms. Samples (September, 1970) from Lakes Superior, Huron, and Michigan showed practically no

acetylene reduction. Acetylene reduction by samples taken from Green Bay of Lake Michigan varied as a result of a nutrient concentration which af first supported growth of phytoplankton requiring combined N, then was diluted so that it could only support primarily those species able to fix N2, and finally was depleted to the point where organisms typical of oligotrophic waters predominated. These experiments demonstrated the suitability of the acetylene reduction assay for following changes in rates of N2-fixation by nodulated legumes in the field and by blue-green algae in lakes. The assay also served to define various trophic levels in lakes and to locate zones of eutrophication in the Great Lakes. (Holoman-Battelle) W73-01456

FOOD AND TROPHIC RELATIONSHIPS OF THE DEVELOPMENTAL STAGES OF MARINE COPPRODS EUCHAETA JAPONICA MARU-KAWA AND CALANUS PLUMCHRUS MARU-KAWA, British Columbia Univ., Vancouver. For primary bibliographic entry see Field 05A. W73-01457

NUCLEAR POWER: THE SOCIAL CONFLICT, Georgia Inst. of Tech., Atlanta. Dept. of Civil En-gineering. For primary bibliographic entry see Field 05B. W73-01565

ECOLOGICAL CONSIDERATIONS IN REACTOR POWER PLANT SITING,
Oak Ridge National Lab., Tenn.
S. I. Auerbach, D. J. Nelson, S. V. Kaye, D. E.
Reichle, and C. C. Coutant.

Revision entil Aspects of Nuclear Power Stations Symposium, New York, August 10-14, 1970, Inter-national Atomic Energy Agency, Vienna, 1971. 19 p. 1 fig. 1 tab, 47 ref.

Descriptors: "Thermal pollution, "Cooling water, "Ecology, "Nuclear powerplants, "Radioisotopes, Fish, Sites, Temperature, Nuclear energy, Aquatic life, Lethal limit, Identifiers: "Dose rate, Thermal effects.

Identifiers: *Dose rate, Thermal effects.

Studies suggest that the irradiated population of mosquito fish (Gambusia affinis affinis) have a significantly greater fecundity than the control populations. At the lowest exposure rate of 0.5 r/day, an exposure rate which is 105 times greater than background, the irradiated stock of chimook salmon (Oncorhynchus tshawytscha) returned in greater numbers and produced a greater total of viable eggs than the controls. Most of the elements with short biological half-lives concentrate in soft tissues of mammalian species, whereas the remainder with extended biological half-lives have long residence times in slowly metabolizing or inert tissues such as bone, teeth, or hair. Through thermal shocks, powerplants can act as large, artificial predators to small, planktonic or pelagic or ganisms. Distribution data on entrainable organisms in the receiving water can minimize the effect of thermal shock on the aquatic comunity. A survey of 61 power reactor design revealed an average rise of 10.8 C and a range of 5.6 C to 18.0 C across the condenser. Small temperature changes can interact with other constituents and modify uptake, turnover or toxicity of these materials. (Upadhyaya-Vanderbilt)

TECHNICAL ASPECTS OF CONTROLLING WATER POLLUTION RESULTING FROM THERMAL POWER PLANTS WITH CONVENTIONAL AND NUCLEAR GENERATORS (ASPECTS DE NATURE TECHNIQUE QUE PRESENTENT, EN MATIERE DE PROTECTION DES EAUX, LE PRELEVEMENT ET LA

RESTIT UTION D'EAU DE REFROIDISSE-MENT POUR LES CENTRALES THERMIQUES CLASSIQUES OU ATOMIQUES). Departement Federal de l'Interieur, Bern (Swit-

For primary bibliographic entry see Field 05G. W73-01572

REPORT ON THE ANALYSIS OF THERMAL POLLUTION OF THE RHINE RIVER RESULT-ING FROM POWERPLANTS (BEITRAG ZUR

ING FROM POWERFLANTS (BEITRAG ZUR ANALYSE DER ZULASSIGEN KRAFTWERK-SBELEGUNG DES RHEINS IM HINBLICK AUF DIE THERMISCHE BELASTUNG), Kernforschungszentrum, Karisruhe (West Germany). Institut fuer Angewandte Reaktorphysik. P. Jansen, W. Schikarski, and H. Stehfest. Available from the National Technical Information Service as KFK 1511, 33.00 in paper copy, \$0.95 in microfiche. Report KFK 1511, December 1971. 27 p, 14 fig, 2 tab, 4 ref.

Descriptors: *Powerplants, *Thermal pollution, *Temperature, *Standards, Thermal powerplants, Efficiencies, Rivers, Water pollution, Water quality, Cooling, Mixing, Electrical power production, Electric power industry, Water quality standards. Identifiers: *Rhine River, *Germany, Power yield, Thermal efficiency, Natural cooling.

Thermal efficiency, Natural cooling.

The pollution of Rhine River resulting from thermal power plants is examined in the light of the most important parameters. These are: The maximum permissible water temperature, the maximum permissible water temperature, the maximum permissible increase in temperature, the desired average power yield of the power stations, their efficiency, and the meteorological data of consequence for the natural cooling of the river. The results show that for realistic values of increase in temperature, a maximum temperature >20C has little effect on the permissible level of power production along the Rhine. They show further that natural cooling effects, while uncertain in magnitude, have little effect on this level. For a temperature increase of 3C, a power yield of approximately 60% and a thermal efficiency of 32%, the permissible level of electric power production along the Rhine is 12 GWe. For an increase of 5C the respective value is 21 GWe. (Oleszkiewicz-Vanderbilt) W73-01573 W73-01573

POWER, POLLUTION, AND THE IMPERILED

ENVIRONMENT,
Institution of Electrical and Electronics Technician Engineers, London (England).
G. D. Friedlander.
Institute of Electrical and Electronic Engineers Spectrum, Vol 7, No 11, p 40-50, November 1970.
7 fig. 7 ref.

Descriptors: *Electric power industry, *Thermal powerplants, *Environmental effects, Powerplants, *Thermal pollution, Electric power demand, Hydroelectric power, Nuclear powerplants, Pumped storage, Hazards, Fossil fuels, Economics, Radioactive waste disposal. Identifiers: *Unconventional power sources.

The utility companies are understandably frustrated: they are boxed into a two-way crunch of environmental conservation vs. the rising demand for electric energy. The power industry has three basic technologies to meet this demand: hydroelectric generation, steam turbogenerators, and gas turbines. But the number of natural hydro and gas utrouse. But use mander of natural system plant sites (except for pumped storage) is limited; hence little additional generation from this pollu-tion-free source is likely. Both pumped-storage and gas-turbine plants - well suited for peaking and gas-turone plants - wen suited for peaking power and emergency reserve duty - are not economical for base-load operation. Steam, the prime mover for the operation of turbogenerators, is produced either by fossil-fuel-fired boilers or by

nuclear reactors. The familiar by-product of the fossil-fuel plant is air pollution through the emission of noxious gases and solid particulates into the atmosphere. The primary coacern in the nuclear plant today seems to be the thermal pollution of waterways; of secondary concern is the radiation hazard. Nevertheless, the bulk of new generating capacity will be met by steam turbogenerator stations, and the projected levels of future environmental pollution will be related to this type of power generation. (Oleszkiewicz-Vanderbilt)
W73-01574

USE OF SIMULATION IN THE DEVELOP-MENT OF REGIONAL PLANS FOR PLANT STI-ING AND THERMAL EFFLUENT MANAGE-MENT, Battelle Memorial Inst., Richland, Wash. Pacific

Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs. R. T. Jaske. American Society of Mechanical Engineers Publi-cation, 71-WA/Pwr-3, July 20, 1971, 12 p, 9 fig. 15 ref. AEC AT (45-1)-1830.

Descriptors: "Mathematical models, "Heat "Cooling, Heat transfer, "Thermal pollution Thermal powerplants, Mississippi River, Ohis River, "Model studies, Water pollution, Environ mental effects, Management, Regional analysis. Identifiers: "COL HEAT model, "Simulation modeling, Heat assimilative capacity.

A multiple option siting strategy based on common pool resources management technology is reviewed. A feasible plan for the public display of planning options is outlined. Simulation of thermal discharges is demonstrated with the COL HEAT simulation model, and applications to two major river basins, the Ohio and the Upper Mississippi, are described. The capacity of the basins to assimilate thermal discharges is computed under extremes of flow and weather under present state standards. Conclusions are (a) large unit size, a serious deterrent to effective basin management, forces regression in efficiency from the highs of several years ago and (b) with an effective advanced siting plan, sufficient assimilative capacity exists on the lower Ohio and Upper Mississippi to handle the area power needs through the year 2000 provided that flexibility in the use of topping towers and stream flow management can be carried out to an effective level. (Oleszkiewicz-Vandervill) A multiple option siting strategy based on com-W73-01575

AN EVALUATION OF ENERGY GROWTH AND AN EVALUATION OF ENERGY GROWTH AND USE TERNIDS AS A POTENTIAL UPPER LIMIT IN METROPOLITAN DEVELOPMENT, Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
R. T. Jaske.

Paper presented at Proceedings of Combined 2nd Annual Thermal Power Conferences and 8th Bien-nial Hydraulics Conference, Washington State University, October 5-8, 1971. 20 p, 6 fig, 2 tab, 11

Descriptors: "Thermal powerplants, "Electric power demand, "Urbanization, Electric power, Powerplants, Thermal powerplants, "Thermal pol-lution, Air pollution, Water pollution, Pumped storage, Meteorology, Mixing, Environmental effects *Urban

Metropolitan development.

Energy use and distribution as forecast from a composite of authoritative United States sources has illustrated that the extent of energy concentranas mustrated that the extent of energy concentra-tion in large metropolitan areas is expected to reach significant fractions of the solar input to the earth's surface. Related trends in prime mover development which have tended to decrease overall thermal efficiency relative to economic

Group 5C-Effects of Pollution

forces tend to exacerbate the problem of energy release concentrations. Examinations of total energy release suggest a direct relationship in weather modification of metropolitan areas such that mean temperatures are increased, cloudiness is increased and total precipitation is markedly increased. Thermal energy release appear as a stabilizing element in decreasing the ventilation of pollutants from large cities. Forecasts of total energy release in metropolitan areas as large as the Boston-Washington megalopolis and greater Los Angeles indicate heat fluxes of 30 to 40% of the incident solar energy by the year 2000 AD. Sach releases have been shown to cause temperature increases on the order of 5 to 15 F in the mean ansual temperature which in turn can be expected to affect stream temperatures and the power demands for air conditioning. (Oleszkiewicz-Vanderbäl) W73-01576

THE ROLE OF ELECTRIC POWER IN MINIMIZING TOTAL POLLUTION FROM

MINIMERICA ENDREGY USE, Westinghouse Electric Corp., Philadelphia, Pa. Environmental Systems Dept.

s. n. wright. American Power Conference Proceedings, Chicago, Illinois, Vol 33, April 1971. 11 p, 2 fig, 6 tab, 11 ref.

Descriptors: "Electric power production, "Electric power demand, "Air pollution, Water pollution, Fossil fuels, Environmental effects, Uranization, Coals, Powerplants, Hermal powerplants, Heating, Heat transfer, Radiation, "Thermal pollution.

Identifiers: "Energy use.

While considerable progress has been made in reducing air pollutants from energy use, particularly from fossil-fueled power plants, much additional effort must be applied just to prevent matters from becoming worse as more energy is consumed by our society. The systems planning of energy use patterns is suggested as a practical method of improving environmental quality, particularly in the urban centers. Increasing electric ticularly in the urban centers. Increasing electric power as a primary energy converter by a factor of three over present patterns should cut pollutant emissions nationally by more than 50 percent and in the urban center by as much as a factor of 3 or 4. Only with this energy pattern can nuclear power play a really significant role in improving environmental quality. The added use of electricity and the use of discharge heat from power production in space heating and certain process industries, should provide an annual savings of 10 to 15 percent in U.S. total energy requirements. (Olesz-kiewicz-Vanderbilt) W73-01577. W73-01577

A FISH STUDY ON THE MISSISSIPPI RIVER AT MONTICELLO, MINNESOTA, Saint Cloud State Coll., Minn. Dept. of Biology. H. P. Scherer. Master's Thesis, June 1970. 75 p, 10 fig, 8 tab, 12 ref. OWRR B-032-MINN (2).

Descriptors: "Mississippi River, "Limnology, "Fish populations, Nuclear powerplants, Powerplants, Thermal pollution, Water pollution, Biology, Sport fishing, Physicochemical properties, Environmental effects, "Minnesota. Identifiers: "Limnological studies, Microhabitat, Shocking, Monticello (Minn).

The fish portion is presented of a complete ecosystem study which has been made to establish baselines for future studies. These studies will delineate the effects the heated discharge water from a nuclear power plant constructed on the Mississippi River near Monticello, Minnesota is expected to cause. The present study has determined: (1) population makeup, by species, of the

fish from a point one mile above the plant site to a point approximately five miles below the site; (2) migration patterns exhibited by the various species of fish inhabiting the study area; (3) an evaluation of indices of physical condition, by age groups within species; and (4) the use made of microhabitat by the various species. Each species was shown to have particular requirements of habitat wherein it was best able to function. (Oleszkiewicz-Vanderbilt)

CORING, DESCRIPTION AND MERCURY AND LEAD ANALYSIS OF LAKE BOTTOM SEDI-

MENTS, Air Force Inst. of Tech., Wright-Patterson AFB,

Ohio.
M. S. Hayner.
Available from the National Technical Informa-tion Service as AD-741 436, \$3.00 in paper copy, \$0.95 in microfiche. Master's Thesis, April 1972. 72 p. 11 fig. 5 tab, 15 ref, 2 append

Descriptors: "Analytical techniques, "Core drilling, "Lead, "Mercury, "Lake beds, Analysis, Methodology, Testing procedures, Sampling, Sediments, Toxins, Computer programs. Identifiers: "Gravel Lake (Ohio), Background

levels.

Equipment and standard techniques for collection and analysis of lake bottom sediments were successfully developed. Sediments must be sampled from lakes and rivers near the suspected source in order to monitor specific discharges. This analysis is limited to mercury and lead. Mercury is present in coal, lead in aircraft fuels. These results can be utilized in establishment of guidelines for future discharge of waste materials. No trends of increasing or decreasing mercury or lead concentrations, mor any anomalous concentrations of mercury or lead on the sediments of Gravel Lake, Wright-Patterson Air Force Base, Ohio, were found. There has been no significant change in the airborne discharge of mercury or lead near Gravel Lake during the lake's existence (1956-1972). Levels of mercury and lead concentration, as recorded in Gravel Lake, are of the same magnitude as the present backgroung levels throughout the Miami Valley, hence no significant contamination has occurred, indicating that aircraft exhaust and other Air Force activities in this area have not discharged sufficient mercury or lead to cause contamination. A basis for better understanding of Air Force effects on the environment is provided by these results. (Jones-Wisconsin)

ENVIRONMENTAL QUALITY. THE THIRD ANNUAL REPORT OF THE COUNCIL ON ENVIRONMENTAL QUALITY.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price \$2.00. Council in Environmental Quality, Washington, D.C. 450 p. 26 fig, 30 tab, 581 ref. 20 append. Aug 71.

Descriptors: *Environment, *Quality control, Forecasting, International waters, Economics, Decision making, Legal aspects, Wildlife, Federal governments, State governments, Local governments, Costs, National parks, Monitoring, Air pollution, Water pollution, Economic impact, Pesticides, Land use, Oceans. Identifiers: *Environmental indices, *National Environmental Policy Act, Noise pollution, International aspects, Ocean pollution.

The Third Annual Report of the Council on Environmental Quality covers Federal and State activities during the past year, the development of environmental indices, and the legal implications of the National Environmental Policy Act. Environmental monitoring information and difficul-

ties of developing indices are discussed in context of several aspects: air pollution, water pollution, pesticides, land use, wildlife, and toxic substances. Quality and availability of data in each area has been studied intensively. The chapter on international aspects of environmental quality not only covers major developments over the past year such as the U.N. Conference on the Human Environment, but also deals with specific substantive areas such as the trade effects of environmental controls between trading nations. The chapter on forecasting the future discusses the interrelationships of population, resources, agricultural productivity, technology, pollution and other factors in shaping man's future environment. The chapter on National Parks deals with the history of the National Park System, the pressures these parks are under, and the steps being taken to deal with such pressures. The National Environmental Policy Act has become the basic policy-setting Federal law relating to environmental protection. (Jones-Wisconsin)

THE ECOLOGY OF DIATOMS IN HARD-

WATER HABITATS,
Iowa State Univ., Ames. Dept. of Botany and
Plant Pathology.
D. Dodd.

D. Dodd. Copy available from GPO Sup Doc, EP1.16:18050 DIE 12/71, \$0.65; microfiche from NTIS as PB-213 005, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, February 1971. 62 p, 6 tab, 53 ref.

Descriptors: *Diatoms, *Habitats, *Hardness (Water), *Iowa, Systematics, Cores, Distribution, Pollen, Peat, Bogs, Lakes, Rivers, Streams, Ditches, Ponds, Marshes, Soils.
Identifiers: *Diversity indices, Dead Man's Lake

Diatoms comprise the major group of algae in lows waters. Their ecological significance, important in pollution evaluation studies, cannot be fully appreciated without a thorough knowledge of their taxonomy. This a major part of the research presented. A scale for abundance rating was used giving at least a rough estimate if data permitted. The names of 50 diatom genera occurring in Iowa are listed and for each genus, the number of taxa in the master list and the number in the 'more common' list are presented. A pollen analysis is tabulated; the samples in this analysis extended through 35 ft. of sediment to the postglacial interface at Little Miller's Bay, Lake West Okoboji. Dating was conducted by the radiocarbon technique for samples taken between 34 ft. and 35 ft. in the sediment core. Since this level had the maximum spruce pollen concentration and the pollen percentage decreased progressively above this level, it was considered as the postglacial interface. Some interesting problems lie in consideration of those diatoms which have disappeared from the original lake flora and those which have become common only since the middle of the postglacial period. (Jones-Wisconsin)

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INORGANIC SULFUR OXIDATION BY IRON-OXIDIZING BACTERIA, Syracuse Univ., N.Y. Dept. of Biology. G. Lundgren. Copy available from GPO Sup Doc, EP2.10:14010 DAY 06/71, \$1.25; microfiche from NTIS as PB-213 006, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, June 1971. 149 p. 21 fig, 32 tab, 98 ref.

Descriptors: "Mine drainage, "Biochemistry, *Iron bacteria, "Thiobacillus ferrooxidans, *Analytical techniques, Oxidation, Sulfur, Iron, Colorimetry, Enzymes, Metabolism, Hydrogen ion concentration, Acid mine water, Cytological studies.

Identifiers: Glucose metabolism.

Sultur metabolism of Thiobacillus ferrooxidans and rhodanese-sulfite oxidase enzymes were studied. As disclosed by electron microscope examination, the purified cell eavelope of lipopolysaccharide contains a very high quantity of ferric fron. A new colorimetric whole cell assay was developed to study iron oxidation. The presence of pyrophosphatase enzyme was revealed for the first time in chemolithorophic microorganisms. Study of energy sources disclosed that the chemolithtrophic T. ferrooxidans can evolve heterotrophic mechanisms and grow on glucose, following the Entner-Doudoroff pathway. (Wilde-Wisconsin)

SURVEY OF BENTHIC MACROINVER-TEBRATES AND ANALYSIS OF WATER AND SEDIMENT FROM THE BUFFALO RIVER 1949, State Univ., Coll., Buffalo, N.Y. Great Lakes Lab. For primary bibliographic entry see Field 05A. For primary W73-01610

SURVEY OF BENTHIC MACROINVER-TEBRATES AND ANALAYSIS OF WATER AND SEDIMENTS FROM THE BUFFALO RIVER

State Univ., Coll., Buffalo, N.Y. Great Lakes Lab. For primary bibliographic entry see Field 05A. W73-01611

ANNOTATED BIBLIOGRAPHY OF LAKE ON-TARIO LIMNOLOGICAL AND RELATED STU-DIES. II. - BIOLOGY, State Univ. Coll., Butfalo, N.Y. Great Lakes Lab. For primary bibliographic entry see Field 02H. W73-01613

ANNOTATED BIBLIOGRAPHY OF LIM-NOLOGICAL AND RELATED STUDIES ON LAKE ONTARIO AND ITS TRIBUTARIES. III. -PHYSICAL, State Univ., Coll., Buffalo, N.Y. Great Lakes Lab. For primary bibliographic entry see Field 02H.

SELECTED REFERENCES CONCERNING THE ALGAE OF LAKE ERIE, II, State Univ., Coll., Buffalo, N.Y. Great Lakes Lab. For primary bibliographic entry see Field 02H. W73-01615

CHROMIUM, CADMIUM, ARSENIC, SELENI-UM, MERCURY AND AQUATIC LIFE: A BRIEF LIFERATURE REVIFW. STEEL Univ. College, Buffelo, N.Y. Great Lakes Lab.

Special Report No 9, November 1971. 23 p. 84 ref.

Descriptors: *Metals, *Chromium, *Cadmium, *Arsenic compounds, *Mercury, Aquatic life, Water pollution effects, Water pollution sources, Toxins, Heavy metals, Bibliographies, Food chains, Lake Michigan, Reviews, Human disease, Lake Rrie.
Identifiers: *Selenium.

Aquatic ecological investigations regarding chromium, cadmium, arsenic, selenium, and mercury were surveyed. There has been a lack of published reports on interactions of heavy metals and aquatic life and on chronic toxicity. Though these heavy metals have adverse effects on general aquatic ecology as well as on human health, it was not until 1953 that water pollutin neatin, it was not until 1993 that water pollutin caused by toxic metals was proved to be the cause of human diseases; one malady is caused by mercury. The mercury 'nattern' may be repeated with respect to cadmium. In 1970, the Japanese proved that cadmium was the cause of the disease 'itai-itai.' A survey by the Federal Water Quality Administration since 1962 included chromium, ar-senic, and cadmium. Arsenic was observed in less than 6.0% of the samples, with average concentra-tion of 0.308 ppm in 4% of Lake Erie samples, which exceed the Public Health Service recom-mended limit. Chromium was detected in 56.0% of the samples collected in the northern United States. Reports of selenium poisoning date from antiquity; during the early 1900's, the death of over 15,000 Wyoming sheep was attributed to vegetation containing selenium. (Jones-Wisconsin) W73-01616

MATHEMATICAL MODELS IN WATER QUALITY MANAGEMENT, Duke Univ., Durham, N.C.

Duke Univ., Dainan, 11.

In: 19th Southern Water Resources and Pollution Control Conference, April 9-10, 1970, Durham, North Carolina. Dept. of Civil Engineering, Duke Univ., Vol 19, p 84-97. 7 fig, 1 tab.

Descriptors: *Model studies, *Mathematical models, *Water quality, *Management, Hydraulic models, Analysis, Hydraulics, Flow charac-teristics.

asic equations involved in modeling hydrau-The basic equations involved in modeling hydraulic and water systems are reviewed and a general method of model construction presented. These hydraulic models exhibit a high degree of accuracy and can solve virtually any hydraulic distribution problem in water pollution control. When many stream and estuarine systems are in critical condition, management needs methods which can show the effects of project beforehand. Property formulated mathematical models can serve as valuable tools for the evaluation of man's activities on the hydraulic and water quality environment and should aid in avoiding costily and time consuming hydraulic and water quality environment and should aid in avoiding costly and time consuming mistakes in the evaluation of alternatives. The quality models are primarily designed to compute the effects of changing flow and point loadings on the system. To enable to compute the effects of biological actions, further studies are needed as such parameters as photosynthesis and respiration are not adequately defined at the present time. Perhaps the availability of these models will stimu-late useful formulations of the more important remaps the availability of these models will stimu-late useful formulations of the more important biological reactions. The range of these programs and the simplicity of their operation will result in greater use of such methods. (Jones-Wisconsin) W73-01617

A PROGRAM FOR THE CONTROL OF CON-TAMINANTS IN NATURAL WATERS, Wisconsin Univ., Madison. Water Chemistry Lab. Report June 1972. 45 p. EPA 5-TO2-WP 00184.

Descriptors: *Water pollution control, *Programs, *Coasts, *Shores, *Littoral, Waste assimilation capacity, Cooling water, Zoning, Management, Social adjustments, Waste disposal, Municipal Social adjustments, waste usposas, naturepara wastes, Industrial wastes, Monitoring, Pathology, Social values, Self-purification, Legislation, Estuaries, Sea water, Toxins, Lethal limit, Chemi-cals, International waters, Human population, cals, International waters, Human population, Freshwater. International waters, Human population, Identifiers: Toxicology, Waste management, Closed-cycle systems.

Current patterns and trends, coupled with current technology for waste management, will ultimately lead to exceeding the contaminant assimilative capacity in essentially all natural waters. Any reach of the coastal zone—that part of any natural water system, river, lake, stream, estuary, and ocean and associated lands—has a finite assimila ocean and associated lands—nas a tinute assimila-tive capacity for a contaminant without causing significant deleterious effects. Existing scientific information does not, in general, enable a precise assessment of the assimilative capacity of the natural waters for certain contaminants. Recom-mendations, which should be accepted internationally, are presented: conduct detailed mass balance and dynamic interactions studies of poten-tially significant pollutants; develop criteria for critical concentrations of pollutants; develop management capabilities (legal, economic, social, and technical) for screening new chemical and degradation products; develop management plans for pollution control; evaluate any manipulation of coastal zone use relative to effect on pollution and utilization; adont closed cycle-minium discharge. coastal zone use relative to effect on pollution and utilization; adopt closed cycle-minimum discharge waste water disposal systems; establish monitoring programs for known pollutants; establish laboratories to discover unrecognized pollutants; initiate a special laboratory to determine effects of pathogenic organisms; the typical chemical composition of all direct discharges of municipal and industrial waste waters should be reported; waste disposers and discharges shall bear the burden of proof. (Jones-Wisconsin) W73-01618

ENVIRONMENTAL FACTORS AFFECTING THE STANDING CROP OF FORAMINIFERA IN SUBLITTORAL AND PSAMMOLITTORAL COMMUNITIES OF A LONG ISLAND SALT

COMMUNITIES OF A LONG ISLAND SALT MARSH,
City Coll., New York. Dept. of Biology.
N. J. Matera, and J. J. Lee.
Marine Biology, Vol 14, No 2, p 89-103, 1972. 9
fig, 7 tab, 38 ref. AEC AT (30-1)3995.

Descriptors: "Environmental effects, "Standing crops, "Protozoa, "Littoral, "Aquatic plants, Biological communities, Salt marshes, Shores, Lagoons, Deltas, Benthos, Habitats, Sediments, Particle size, Niches, Distribution. Identifiers: "Foraminifera, Sublittoral, Psammolit-toral, Epiphytes, North Sea Harbor (Long Island).

To determine how salt marsh foraminifera communities can reflect some processes within marshes, adjacent lagoons, and deltas, a study was made in 1966, 1967 and 1968. The epiphytic commade in 1906, 1907 and 1908. The epiphytic com-munities of Enteromorpha intestinalis, Polysiphonia, Ulva lactuca, and Zanichellia palus-tris had the most foraminifera; Codium and Fucus were never substrates for foraminifera. The domi-nant species are listed. Small rivulets flowing nant species are insted. Small rivulets flowing through the marsh at low tide determined the overall distribution pattern of epiphytic foraminifera by effecting small changes in water temperature, salinity and sediment grain size. Distribution was biomodal, with peaks in early June and the first property of the peaks in early June and the first property of the peaks in early June and the first property of the peaks in early June and the first property of the peaks in early June and the peaks in early and the p and late July. There were fewer species but larger and the July. Increase were there species out anger standing crops of foraminifers in the sediments. Distribution of the most abundant species, Am-motium salsum, Alphidium incertum and Trochammina inflata was correlated with vertical and horizontal changes of grain size. No evidence was obtained to suggest that foraminifera migrate was obtained to suggest that foraminirer migrate in the sediments as a function of tidal changes. Several clues to niches of some species were obtained. The overlying epiphytic communities and not continuous with the psammotitoral communities below them in the water column. (Jones-Witchestein)

SITE OF NITROGENASE ACTIVITY IN THE BLUE-GREEN ALGA ANABARNA SP. L-31, Bahaba Atomic Research Centre, Bombay (India). Biology Div.

Biology Div.
J. Thomas, and K. A. V. David.
Nature New Biology, Vol 238, August 16, p 219221, 1972. 4 fig, 2 tab, 17 ref.

Descriptors: *Nitrogen fixation, *Cytological studies, *Anabaena, Enzymes, Cyanophyta, Photosynthesia, Cultures, Pigments, Nocturnal, Identifiers: Nitrogenase activity, Heterocysts,

Aerated cultures of Anabaena sp. L-31 were grown in a medium free from combined nitrogen.

Group 5C-Effects of Pollution

Samples were harvested to determine reducing activity of heterocysts and vegetative cells. The findings indicate that heterocysts are the preferred sites of nitrogenase activity during active photosynthetic growth of blue-green algae. Heterocyst differentiation appears a requisite for ensuring high rates of nitrogen fixation accompanying photosynthesis. Nitrogen fixation rate is determined not only by heterocyst, prepentage but Heterocyst differentiation appears a requisite for ensuring high rates of nitrogen fixation accompanying photosynthesis. Nitrogen fixation rate is determined not only by heterocyst percentage but also by the nitrogenase activity of individual heterocysts. Requirement of fixed nitrogen for exponential growth phase of Anabaena appears to be accomplished by a preliminary buildup of a high percentage of heterocysts with high nitrogenase activity. A functional dedifferentiation is suggested in heterocysts of older cultures with the reappearance of photosystem II, when these cells may revert to a photosynthetic role. Vegetative cells are not precluded as loci for nitrogenase activity in low light intensities or in dark situations that prevail in deep marine waters. In nature, non-heterocystous blue-green algae may very possibly show a diurnal rhythm of photosynthetic carbon assimilation, alternating with a nocturnal rhythm of nitrogen fixation. Nitrogen fixation combined with efficient photosynthesis would necessitate the presence of heterocysts in blue-green algae. (Jonez-Wisconsin)

TOXICITY OF THE OIL DISPERSANT, COREXIT 7664, TO CERTAIN AUSTRALIAN MARINE ANIMALS, Queensland Littoral Society, Lucinda (Australia). D. A. McManus, and D. W. Connell.

Search, Vol 3, No 6, p 222-224, 1972. 1 fig, 19 ref.

Descriptors: *Surfactants, *Toxicity, *Dispersion, Oil spills, Australia, Marine animals, Shrimp, Crabs, Biodegradation, Lethal limit, Coral, Fish, Tropical regions, Subtropic. Identifiers: *Corexit 7664.

Reports from field and laboratory studies show that oil dispersants are usually toxic to aquatic life in low concentrations. This study determines the short term toxicity of the oil dispersant, Corexit 7664, on four species of subtropical marine animals: fortesque fish, perchlet, hermit crab, and shrimp. During some of the tests a degree of 'cloudiness' developed in the Corexit solutions, resulting from development of microorganisms, probably due to surfactant biodegradation. Since this may lead to depletion of dissolved oxygen, the dissolved oxygen levels in several test solutions were monitored. These experiments indicated that comparatively high concentrations of the surfactant are needed to induce mortality in the test species. In a complex natural population the stage of development and condition of an animal as well as environmental factors may have a considerable influence on the exhibited toxicity. In a spill situaenvironmental factors may have a considerable in-fluence on the exhibited toxicity. In a spill situa-tion the surfactant may be mixed with refined or crude petroleum products, markedly affecting the toxicity exhibited in the laboratory. Long term sublethal effects, which may be of particular im-portance, were not studied. The test animals in almost all concentrations exhibited a greatly reduced mobility and reaction to stimuli compared with the controls. (Jones-Wisconsin)

MORPHOGENESIS IN THE RED ALGA, GRIF-FITHSIA PACIFICA: REGENERATION FROM SINGLE CELLS, Washington Univ., Seattle. Dept. of Botany. C. S. Duffield, S. D. Wasland, and R. Cleland. Planta (Berl.), Vol 105, p 185-195, 1972. 7 fig, 27 ref. AEC AT (45-1)2225.

Descriptors: *Algae, *Rhodophyta, *Pla morphology, *Plant growth, Cytological studies. Identifiers: *Griffithsia pacifica, *Regeneration.

A system for studying form development in a red alga is described. Plants of the marine giant-celled Griffithsia pacifica regenerate from a single, isolated shoot cells following a regular and predictable pattern. The culture for this study was collected in Mexico in 1966 and had been maintained in unialgal condition. Regeneration of plants from isolated shoot cells makes a suitable system for study of morphogenesis control in red algae. The cells large size facilitates both experimental manipulations and observations. Because of morphology and cell size, Griffithsia species have been widely used in biochemical, cytological, and electrophysiological studies. It has the advantage of multicellularity without complexities such as cortication found in many red algae. Regeneration can be initiated from any cell of the plant. The development is sufficiently rapid that a plant of 30-40 shoot-cells is produced from a single cell within a week. This investigation is apparently the first in which the pattern of development of individual plants has been followed with time and in which kinetics of cell division and cell elongation have been elucidated. (Jones-Wisconsin)

N.M.R. STUDIES OF CHLORINATED POLY-CYCLODIENE PESTICIDES, Environmental Protection Agency, Athens, Ga. Southeast Water Lab.; and National Inst. of En-vironmental Health Sciences, Research Triangle

Vironiental reatin Sciences, Research Frangie Park, N. C. L. H. Keith, A. L. Alford, and J. D. McKinney. Analytica Chimica Acta, Vol 60, p 1-11, 1972. 5 fig, 2 tab, 25 ref.

Descriptors: "Pesticides, "Chlorinated hydrocar-bon pesticides, "Degradation (Decomposition), *Analytical techniques, Spectroscopy, Chemical reactions, Resonance, Aldrin, Dieldrin, Endrin. Identifiers: "Polycyclodiene pesticides, Isodrin, Photodieldrin.

Influence on the environment of widespread pesti-cide use has prompted structural elucidation of their degradation or metabolic products by nuclear their degradation or metabolic products by nuclear magnetic resonance (n.m.r.) spectroscopy. N.m.r. spectra of chlorinated polycyclodiene pesticides aldrin (I), dieldrin (II), isodrin (III), endrin (IV), and the important photolytic product of IV, photodieldrin (V) are studied. The spectra of I-IV photodeldrin (V) are studied. The spectra of I-IV are similar in many respects and the proton signals of these four compounds are discussed as a group. Spectra of photodieldrin are considered separately. All spectra were recorded with a Varian HA-100 n.m.r. spectrometer, a 2-3% solution of tetramethylsilane (TMS) used as internal standard. Homonuclear decoupling experiments were per-formed with three Hewlett Packard Model 200-AB formed with three Hewlett Packard Model 200-AB audiooscillators. Complete n.m.r. coupling constants for aldrin, dieldrin, isodrin, endrin, and photodieldrin were derived by double, triple, and, where necessary, quadruple resonance studies. Both normal 'W' long-range couplings and 'non-W' long-range couplings were prevalent. Large paramagnetic shifts were induced by Eu (DPM)-3 and plots of the change in chemical shift versus the reciprocal of the cube of the distance from europium permitted tentative configurational assignment of the migrated proton in photodieldrin. (Jones-Wisconsin)

BIOSYNTHESIS OF METHYLHEPTADECANES IN ANABAENA VARIABILIS. IN VITRO IN-CORPORATION OF S- (METHYL-C14) ADENOSYLMETHIONINE, Florida State Univ., Tallahassee. Dept. of Chemis-

try. W. G. Fehler, and R. J. Light. Biochemistry, Vol 11, No 13, p 2411-2416, 1972. 8 fig, 5 tab, 11 ref.

Descriptors: *Cytological studies, *Biochemistry, *Anabaena, Catalysts, Organic compounds,

Proteins, Pigments, Cyanophyta, Chemical reac-tions, Ions.

1dentifiers: *Methylheptadecanes, *Anabaena variabilis, Precursors, Methyls, Hydrocarbon, Decarboxylation.

Decarboxylation.

An extract of Anabaena variabilis cells which will catalyze the incorporation of S. (methyl-C14)adenosylmethionine into hydrocarbon can be obtained by sonication of a concentrated, plyozyme-treated, cell suspension. Maximum release of activity is obtained by 6 to 8 minutes of sonication in the presence of magnesium ions, and by 2 to 4 minutes in the absence of magnesium ions. There is a parallel release of protein as illustrated by the phycocyanin pigments. Microscopic examination of the suspension showed that the phycocyanin pigments. Microscopic examination of the suspension showed that plyozyme treatment was sufficient to convert most of the cells to spheroplasts. Gas-liquid chromotography analysis of the incorporated radioactivity showed that more than 99% of the product is accounted for in the methyleptadecane fraction. An endogenous acceptor is indicated to be present in the crude extract which can accept the methyl group in the process of being converted to hydrocarbon. Cells from older cultures yielded somewhat more stable extracts than cells from younger cultures. The apparent Km based upon the points at higher substrate concentrations is 0.00011 M. There is also a pH effect on stability of the extract, thus all experiments were run at pH 7.0 and a partial dependence on NADPH. (Jones-Wisconsia) Wisconsin) W73-01624

DEEP RESERVOIR THERMAL STRATIFICA-

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DEEP RESERVOIR THERMAL STRATIFICA-TION MODEL, Auburn Univ., Alabama. Dept. of Mechanical En-gineering; and Alabama Power Co., Birmingham. Water and Air Resources Section. For primary bibliographic entry see Field 02H. W73-01629.

RESPIRATORY ACTIVITIES OF CHLORELLA ELLIPSOIDEA IN VARIOUS NITRIENT MEDIA, Taiwan Provincial Chung Hsing Univ., Taichung. Inst. of Botany. J. Tschen, and S. T. Liu. Botanical Bulletin of Academia Sinica, Vol 12, p 50.55 [27] 7 fg. 4 hb. 27 med.

Botanical Bulletin of Academia Sinica, Vol 12, p 50-56, 1971. 2 fig. 4 tab, 27 ref.

Descriptors: *Laboratory tests, *Respiration, *Chlorella, *Nutrients, Cultures, Nitrogen, Potassium, Phosphates, Metabolism, Algae, Synthesis, Vitamins, Sulfates, Ions.
Identifiers: *Chlorella ellipsoidea, Culture media.

Identifiers: *Chlorella ellipsoidea, Culture media.

Population density of fresh-water algae in a batch system in small vessels depends on cultural conditions. In selecting optimal cultural media for fresh-water algae, Chlorella ellipsoidea was cultured in various nutrient media, and the respiratory activity determined by a Warburg respirometer. The following media were studied: Bold's Basal Medium, Kantz' modified BBM and Ott's. Oxygen uptake was found to be highest in BBM with decreasing order in 5N-BBM, KBBM, and Ott's medium. Higher respiratory activity in BBM may be attributed to nitrate components. Decreased respiration in KBBM is related to lower potassium and phosphate contents. No growth took place in Ott's medium. Nitrogen is essential in respiration, photosynthesis, and in the synthesis of purines and pyrimidines of RNA and DNA. Nitrogen source in BBM is sodium nitrate, while in 5N-BBM, urea is used instead. Urease was not detected in C. ellipsoidea. This explains why BBM is superior to 5N-BBM. Potassium is essential as an activator for enzymes in certain peptide bond synthesis and so may affect respiration and photosynthesis. Phosphorus, found in many coenzymes, becomes important in photosynthesis, glycolysis, TCA cycle and fatty acid synthesis. (Jones-Wisconsin)

W73-01626

COMPOSITION AND STRUCTURE OF ALGAL COMMUNITIES IN A TRIBUTARY STREAM OF LAKE ONTARIO, Guelph Univ. (Ontario). Dept. of Zoology. J. W. Moore. Canadian Journal of Botany, Vol 50, p 1663-1674, 1972. 6 fig. 2 ub, 33 ref.

Descriptors: "Algae, "Biological communities, "Streams, Lake Ontario, Plankton, Diatoms, Sedi-ments, Hardness (Water), Benthos, Grazing, Systematics, Chemical analysis, Physical proper-ties, Chlorophyta, Euglenophyta, Cyanophyta, Chrysophyta, Scenedesmus, Chlamydomonas. Identifiers: Shelter Valley Creek (Ontario).

Identifiers: Shelter Valley Creek (Ontario).

Seasonal succession, community structure, and the effect of herbivorous grazing on planktonic and epipelic algae in Shelter Valley Creek, Ontario are described. The composition and structure of the algal communities were studied for one year. The overall assemblage consisted of 388 taxa of which 321 were Bacillariophyceae. On the sediments, seasonal succession and community structure was, with some exceptions, typical of hardwater streams in northern temperate zones. The planktonic community was, for the most part, derived from the benthos. Herbivorous grazing by larval sea lamprey, Petromyzon marinus did not noticeably affect algal numbers in either the plankton or sediments. The algae collected are listed. The 388 taxa recorded contained 321 Bacil-airophyceae, 32 Chlorophyta, 20 Euglenophyta, 14 Cyanophyta, and 1 Chrysophyceae. Sixty-six taxa are reported as new occurrences in southern Ontario. Distoms accounted for 93.0 to 99.5% by numbers of the epipelic community. Taxa that occurred frequently throughout the year were Achanthes minutissima, Cocconeis placentula var. euglypta, Gomphonema olivaceum var. balticum, and Navicula tripunctata. (Jones-Wisconsin)

WATER POLLUTION-FACTS AND FAN-

TASIES, Charleston Dept. of Sanitary Engineering, S.C.

J. M. Henderson.

Journal of the Sanitary Engineering Division,
American Society of Civil Engineers, Vol 98, No
SA3, p 529-546, 1972. 1 tab, 34 ref.

Descriptors: *Legislation, *Water pollution, *Ecology, *Standards, Economics, Federal jurisdiction, History, Human population, Water pollution control, Industries, Eutrophication, Water pollution sources, Animal wastes (Wildlife), Waterfowl, Programs. Identifiers: Fecal coliform pollution.

Genuine conservationists, who include civil engineers or their equivalent, with broad perspectives and rational approach to problems of man's resources, are contrasted with pseudo environmentalists who demand neat and simple solutions. resources, are contrasted with pseudo environ-mentalists who demand neat and simple solutions. The conservationists favor setting priorities in relation to existing local situations and harmoniz-ing comprehensive national needs and objectives. Opposed to unrealistic objectives, they usually favor decentralized power for flexibility of deci-sion; they believe in fiscally responsible local, state, and national governments. The validity of some facets of assumptions and related legislation and regulations based on a climate of opinion, sup-ported by a vocal minority, is explored. Historial and present perspective on natural pollution and population changes as an index of pollution con-trol need are given. A section is concerned with the vast network of minor tributary channels and impoundments, natural and artificial, and their classification. Ecological futility of many installa-tions in cleaning up streams by ignorant methods is apparent. The latest estimate of the economic cost over the first 25 years of carrying out legislation passed by the Senate in 1971 is \$1 trillion, exclusive of air and solid wastes pollution control. (Jones-Wisconsin) W73-01628

ENVIRONMENTAL EFFECTS ON THE GROWTH OF NITROGEN-FIXING BACTERIA, Sussex Univ., Brighton (England). Unit of Nitrogen Fixation (ARC). S. Hill, J. W. Drozd, and J. R. Postgate. Journal of Applied Chemistry and Biotechnology, Vol 22, p 541-558, 1972. 8 fig, 3 tab, 59 ref.

Descriptors: "Nitrogen fixing bacteria, "Plant physiology, Azotobacter, Aerobic bacteria, Cul-tures, Oxygen, Nitrogen, Enzymes, Respiration, Plant morphology, Clostridium. Identifiers: Azotobacter chroococcum, Comfor-mational protection, Oxygen sensitivity, Limiting nutrients, Continuous cultures.

A systematic study survey of nitrogen-fixing bacteria in continuous cultures in the laboratory over the past few years is given. Nutritional status of populations and the physiology of nitrogen fixation, especially that of the aerobic bacterium, Azotobacter chroococcum, were investigated. Sensitivity to excessive oxygenation was specific to nitrogen-fixing populations and was not shown by those assimilating ammonia; C or P-limited populations were hypersensitive. Nitrogen-fixing aerobes are not the only microorganisms to possess oxygen-sensitive enzymes or electron-transport systems which can be interfered with by oxygen. Casual experience suggests they may occur with Aerobacter aerogenes and Thiobacillus thioparus. Yield studies require that the nutritional status of the whole population be known rigidly to be limited by the energy source. It is extremely difficult to obtain stable C-limited populations of aerobic nitrogen-fixing bacteris; though batch cultures have given valuable information, the extension of batch culture techniques to organisms of more exotic metabolism may entail risk. Chemostat value to provide controlled nutritional status for studying repression and derepression phenomena is self-evident and widely accepted; the technique lends itself to study of population density effects and is almost the only way of obtaining partially repressed populations. (Jones-Wisonsin) W73-01629 W73-01629

GENERAL CABLE THEORY FOR CELLS OF ALGAE CHARACEAE, Agrofizicheskii Nauchno-Issledovatelskii Institut,

G. A. Volkov.

Biochimica et Biophysica Acta, Vol 255, p 709-

719, 1972. 3 fig, 3 ref.

Descriptors: *Biological membranes, *Algae, *Cytylogical studies, Plant morphology, Equations, Resistance, Electrical properties. Identifiers: *Cable theory, Electronic potential,

To investigate the biological membrane, the electrical characteristics of membranes and particularly of the outer cytoplasmic membrane of the internodal cell of algae of the Characeae are studied. The so-called cable properties are considered reflection of a certain morphological structure of that cell. Solution of the cable equation is obtained taking into account the definite resistance of cell case of an amplied current of the central case of an amplied current nodes for the general case of an applied current, the strength of which alters with time. Two important cases for the function are considered in detail. tant cases for the function are considered in detail. Practical formulae for determining the fundamental characteristics of the cell are obtained: membrane resistance and capacity (of plasmalemma), anodal resistance, and the characteristic length of the cell. For determination of the membrane time constant and hence the membrane capacity, a simplified method for measuring membrane resistance, suggested by other authors, can be used. Taking into account the nodal resistance of the cell gives an improved value for the electrode position in terms of the critical coordinate. The current electrode has to be inserted in the middle of the cell. (Jones-Wisconsin) W73-01630

TOXIC SUBSTANCES LIST, 1972 EDITION. National Inst. for Occupational Safety and Health, Rockville, Md.
For primary bibliographic entry see Field 05B.
W73-01631

THERMAL POLLUTION AND ALGAE, (VARM-VATTENUTSLAPP OCH ALGER), Uppsala Univ. (Sweden). Inst. for Physiologic

Botany. G. Eriksson, and C. Forsberg. Vatten, Vol 27, No 4, p 441-448, 1971. 3 fig, 41 ref.

Descriptors: "Industrial wastes, "Thermal pollution, "Coasts, Water pollution effects, Aquatic life, Habitats, Ecology, "Ecosystem, "Algae, "Phytoplankton, Oxygen, Photosynthesis, Respiration, Succession, Productivity, Growth rates. Identifiers: *Sweden, Species composition

Nuclear power plants being built along the Swedish coasts have increased interest in the effects of thermal pollution. Increased temperature from installation discharges will change the habitats of many organisms. As algae, especially phytoplankton, have an important role in the ecosystem because of their ability to produce O2 in photosynthesis, it is especially important to know their reactions to temperature changes. The effects of temperature change on phytoplankton photosynthesis, respiration and net oxygen production are summarized. Thermophilic algae, species composition changes, succession, growth rate and production are discussed along with the solubility of O2 in water of varying temperatures. (Ensign-PAI)

FISH DISEASES AND RELATIONSHIP TO FISH

Bureau of Sport Fisheries and Wildlife, Kear-neysville, W.Va. Eastern Fish Disease Lab. G. L. Hoffman.

G. L. Hoffman. In: Fish Kill Investigation Seminar, January 12-14, 1971, Cincinnati, Ohio, p 1-29. April 1971. 52 ref.

Descriptors: "Fish diseases, "Fish parasites, "Fish pathology, "Fishkill, Mortality, Toxicity, Water pollution effects, Fish physiology. Identifiers: Toxicology, Histopathology, Bacteriology, Virology, Parasitology.

Fish diseases and parasite are an important cause of fish kills. If possible, fish should be examined alive or immediately after death. Examination by a toxicologist, histopathologist, bacteriologist, virologist and parasitologist is recommended. Although exact diagnosis can not always be made with histopathologis techniques they can indicate the organs involved and the general type of damage. Fish used in toxicological research and bioassay should be free from disease. If native fish from a polluted area are used for bioassay they should be examined for infectious agents and disease free fish used as replicates of the test. (Ensign-PAI) sign-PAI) W73-01634

MERCURY IN THE ENVIRONMENT: A SUM-MARY OF INFORMATION PERTINENT TO THE DISTRIBUTION OF MERCURY IN THE SOUTHERN CALIFORNIA BIGHT, Southern California Coastal Water Research Pro-

ject, Los Angeles. For primary bibliographic entry see Field 05B.

Group 5C-Effects of Pollution

FOREST FERTILIZATION (A STATE-OF-T-HE-ART REVIEW AND DESCRIPTION OF EN-VIRONMENTAL EFFECTS), Pacific Northwest Water Lab., Corvallis, Oreg.

Pacific Northwest water Lab., Corvains, Ortg. W. A. Groman.
Copy available from GPO Sup Doc EPI.23/2:72-016, 30.65; microfiche from NTIS as PB-213 073, 30.95. Environmental Protection Technology Series Report EPA-R2-72-016, August 1972. 57 p, 3 fig, 2 tab, 46 ref. EPA Program 1B2037.

Descriptors: *Water pollution sources, *Fertilizers, *Forest watersheds, *Reviews, *Forest management, Environmental effects, Fertilization, Forestry, Water quality, Nutrients, Runoff. Identifiers: *Forest fertilization.

Identifiers: *Forest fertilization.

The application of chemical fertilizers to forest soils for site amelioration is one of the newest and most promising methods for increasing production. Concern has risen over possible toxic and cutrophic effects of fertilization on water quality. The Environmental Protection Agency assembled data on the scope and trends of the practice throughout the world in order to determine the extent of actual or potential detrimental effects of forest fertilization, and to evaluate priority for grants. Definitive knowledge on the biological effects of forest fertilization is incomplete or lacking in many aspects of tree physiology and soil sciences, and in the long-term consequences of forest fertilization on toxic and/or eutrophic parameters of water quality. Toxic levels are usually not approached in natural water supplies and the total applied nutrient loss is inconsequental. Results of complete forest fertilization-water quality studies are summarized and evaluated, and the status of current water quality studies is described. Recommendations are given for reviews and new research efforts. (Knapp-USGS) W73-01638

ASSOCIATIONS OF CLADOCERA IN THE ZOOPLANKTON OF THE LAKE SOURCES OF THE WHITE NILE, Westfield Coll., London (England). For primary bibliographic entry see Field 02H. W73-01641

PRIMARY PRODUCTION OF LAKE BAIKAL AND ITS SIGNIFICANCE FOR THE BIOLIM-NOLOGICAL PROCESSES IN THE LAKE. (IN NOLOGICA RUSSIAN), Votintsev.

Izv Akad Nauk SSSR Ser Biol. 6. p 892-900. 1971.

English summary.
Identifiers: *Primary productivity, Biomass,
*Lake Baikal, Limnology, Phytoplankton, USSR,
Water pollution effects.

Primary production in Lake Baikal is presented on the basis of year long limnological investigations of the lake carried out during 1964-1969. The year gross production, its distribution and seasonal in-fluences were evaluated. The correlation values of the primary production (P) and the phytoplankton biomass (B) and the causes of high values of P/B coefficients are discussed. The ultimate fate of pricoefficients are discussed. The ultimate fate of pri-mary production and its transformation along the food chains of the lake ecosystem is briefly sketched. Conclusions are drawn as to the high in-dices of the primary productivity of Lake Baikal and the high efficiency of its food chain utilization in the lake ecosystem.—Copyright 1972, Biological Abstracts, Inc.

FISHING A NUCLEAR-HEATED BALTIC, For primary bibliographic entry see Field 05B. W73-01646

OCEAN DUMPING: WHAT AND WHERE, IF AT ALL, American Society of Civil Engineers, New York. For primary bibliographic entry see Field 05E.

W73-01648

USING COASTAL ZONE MODELS TO PRE-DICT ENVIRONMENTAL IMPACT, EG and G, Inc., Waltham, Mass. Environmental Equipment Div. P. F. Smith, and R. E. Ward. Under Sea Technology, Vol 13, No 14, p 30-32, April, 1972. 3 fig.

Descriptors: "Marshes, "Coastal engineering, "Bays, "Landfills, "Sewage effluents, "Outfall sewers, "Model studies, "Computer models, Water pollution effects, Environmental effects, Tidal effects, Transportation, Current meters.

Tidal effects, Transportation, Current meters.

Evaluation of the environmental impact on a marshland and tidal embayment complex by a proposed landfill project for mass transit expansion is described. Physical processes of the estuarine flushing system were examined, particularly in relation to possible alteration of sewer effluent dispersion patterns. Moored recording current-meter stations were utilized at four locations in the bay to obtain current speed, current direction, and current time. Tracking drogues measured surface currents at the sewer outfall, and a bathymetric survey checked overall water exchange between the bay and the coean. Wind speed and direction information were obtained from a nearby National Weather Service Station. A two-dimensional computer predictive model was then constructed to assess sewage dispersive characteristics. Using an IBM 360 installation, a computer printout of a transition probability matrix was obtained and successive transition probability matrix was obtained and successive transition probability matrixes built for 40 time periods. Using this information, probability of particle travel indicative of dispersion could be plotted. (McEntyre-PAI)

A DROP IN THE OCEAN, For primary bibliographic entry see Field 05G. W73-01652

THE CASPIAN SEA CALLS FOR HELP, (CONTROL OF CASPIAN SEA POLLUTION URGED), A. Iordanskiy.

JPRS Translations on USSR Resources No 120, p 33-44, August 12, 1970. Translated from Khimiya i Zhizn', No 1, p 49-55, January, 1970.

Descriptors: *Water pollution control, *Oil pollution, *Ecology, *Preservation, Mollusks, Fish, Government supports.
Identifiers: *Caspian Sea.

Pollution of the Caspian Sea has upset the sea's ecological balance. A mollusk, called the mitilyaster, is described which is fast disappearing from the Caspian. Fish catches abov sturgeon, herring, and volga zander populations are also declining. Suggested causes are mainly oil waste discharges and oil spills. The best solution to this pollution problem is to create a governmental allunion organ for the protection of the Caspian Sea, with authority and research ability to plan and coordinate pollution control efforts. (McEntyre-PAI) PAI) W73-01654

ELASTIC THREAD POLLUTION OF PUFFIN Nature Conservancy, Abbots Ripton (England).
Monks Wood Experimental Station.
J. L. F. Parslow, and D. J. Jefferies.
Marine Pollution Bulletin, Vol 3, No 3, p 43-45,
March, 1972.

Descriptors: *Birds, Marine animals, *Wastes, *Litter, Water pollution effects, Mortality. Identifiers: *Puffins, *Elastic threads.

The puffin, Fratercula artica, is unique among British breeding seabirds in that, together with the other two pelagic auks, it has undergone marked population declines during the present century. Declines at certain colonies have been due to obvious causes; however, declines at others, notably St. Kilda, Outer Hebrides, have occurred for unknown reasons. Post-mortem examinations were performed on corpses of six birds recently found dead in a colony about to be examined for toxic pollutants. Four of the six birds contained strands of elastic thread in their alimentary tracts. In three of these birds the thread was of an identical, square-sectioned type, suggesting that it is a fairly common pollutant in the North Sea, and, since it has not been found in other auks, that it is selectively being taken by puffins, perhaps mistakenly, for fish. It does not appear that the elastic was first consumed by fish, nince the strips are considerably larger than the lengths of fish taken by puffins. The threads themselves resemble lish as they float near the water surface. The elastic could be a puffin mortality factor. (McEntyre-PAI)

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TESTS ABOUT PESTICIDE CONTENTS IN FISH POPULATIONS OF THE BALTIC SEA (UNTERSUCHUNGEN UBER DEN INSEKTIZIDGEHALT VON OSTSKEFISCHEN), H. von Maier-Bode. Gewasser uad Pestizide, Gustav Fischer Verlag, Suttgart, Germany, 1971. Vol 34, p 57-61. 3 tab.

Descriptors: "Pesticides, "Chlorinated hydrocar-bon pesticides, "Fish populations, Water pollution effects, "Toxicity, "Mortality, Food chains, Public health, DDT. Identifiers: "Sweden, "Baltic Sea, North Sea.

Identifiers: *Sweden, *Baltic Sea, North Sea.

In a governmental final report of the 'Stockholm Conference on Chlorinated Hydrocarbon Pesticides', March 1969, it was concluded that the public health was not immediately endangered by the uses of chlorinated hydrocarbon when used as pesticides. References were made about the question of possible connections between the population decline of many animal species and the concentration of persistent chlorinated hydrocarbon in the food chains. Results of Swedish analyses, taken in the Baltic Sea and along the coastal areas showed suprisingly high content of DDT and other chlorinated hydrocarbons in the fatty and lipoidrich organs of marine animals living there, i.e., seals. Fish samples taken from both the North Sea and Baltic Sea showed the Baltic cod fish contained about 10 times, and Baltic flounder about 3 times, as much DDT than the same North Sea fishes. It is questionable, though, whether or not these results can be used as guidelines due to the fact that only a very small number of individual fishes were tested. (Brown-PAI)

CONCURRENT GROWTH OF BACTERIA AND ALGAE IN A CLOSED VESSEL, Nebraska Univ., Lincoln. Dept. of Chemical En-

P. J. Kenry.

Available from the National Technical Informa-tion Service as PB-212 996, 33.00 in paper copy, 80.95 in microfiche. Nebranka Water Resources Research Institute Technical research project completion report, July 1972. 34 p., 13 tab, 10 ref. OWRR A-020-NEB (1), 14-31-0001-3227.

Descriptors: *Laboratory tests, *Bacteria, *Algae, *Cultures, Cyanophyta, Hydrogen ion concentration, Light intensity, Nutrients, Pseudomonas, Symbiosis.

Symbiosis. Identifiers: Microcystis aeruginosa, Pseudomonas aeruginosa, Limiting nutrients.

Growth responses of pure cultures of Microcystis aeruginosa to carbon dioxide, phosphate, and nitrate are studied to identify the limiting nutrient.

Experiments were conducted on growth of the obligate aerobic bacterium, Pseudomonas aeruginosa for use as a model bacterium in investigation of symbiotic two-species bacterial/algal cultures which may be significant in the eutrophication process. In addition, evidence was found that bacteria removes algal toxic agents which may explain why algae blooms sometimes appear so suddenly and unexpectedly. One bacterial and one algal specie were grown in the same vessel under controlled conditions after the algae were purified of contaminating bacteria. Its responses to glucose, pH, light intensity, and aeration, and agitation rate were determined. During the purification of the algae other other interactions occurred in addition to the transfer of oxygen from algae to addition to the transfer of oxygen from algae to bacteria and the reverse transfer of carbon dioxide from bacteria to algae: two that were very obvious were the transfer of oxygenic excretions to the bacteria and the breakdown of agents toxic to the algae. (Jones-Wisconsin)

PALYTIC SHELLPISH POISONING IN EAST-ERN CANADA, Bedford Inst., Dartmouth (Nova Scotia). A. Prakash, J. C. Medcof, and A. D. Tennant. Fish Res Bd Can Bull. 177. 2-87. Illus. 1971. Identifiers: Bioassay, *Canada, Canning industry, Clams, Control, Gonyaulax-Tamarensis, Mussels, *Palytic shellfish, *Poisons, Shellfish, Water pol-lution effects, Toxins, *Dinoflagellates.

Palytic shellfish, "Poisons, Shellfish, Water pollution effects, Toxins, "Dinoflagellates.

Outbreaks of paralytic shellfish poisoning (PSP) from consumption of toxic shellfish are common in eastern Canada and have involved over 200 reported illnesses and 23 deaths since 1880. The middle and lower reaches of the Bay of Fundy and the lower estuary of the St. Lawrence River are the affected areas. Poisonings occur mainly during summer (June-Sept.) and are associated with abundance of the planktonic marine disoflagellate Gosyaulax tamarensis. Features of poisonings, including symptoms, levels of human sensitivity othellfish poison, treatment and prevention are described. Measurements of shellfish toxicity varies with species of shellfish, area and position in the intertidal 20ne. Shellfish species also differ in anatomical distribution of the poison. Although 14 species of shellfish were shown to become toxic, soft-shell clams and blue mussels account for about 90% of the poisonings. Blue mussels accumulate the largest amounts of toxin in the shortest time. Possible mechanisms of toxin in the shortest time. Possible mense and shortest time. Possible mense and shortest time. Possible mercial canning ach reduce shellfish toxicity by 70-90%, and storage of toxic cann

ASSIMILATION AND TOXICITY OF EX-OGENOUS AMINO ACIDS IN THE METHANE-OXIDIZING BACTERIUM METHYLOCOCCUS CAPSULATUS, Queen Elizabeth Coll., London (England). Dept. of Microbiology.

For primary bibliographic entry see Field 05B. W73-01661

THE NUTRITION OF BACILLUS MEGATERI-UM AND BACILLUS CEREUS, Sheffield Univ. (England). Dept. of Microbiology.

Journal of General Microbiology, Vol 71, No 3, p 505-514, August 1972. I fig. 1 tab, 13 ref.

Descriptors: "Amino acids, "Nutrient requirements, "Amino acids, Nutrients, Cultures, Vitamins, Water pollution sources, Aquatic bacteria, Gold bacteria, Growth rates, Viability, Identifiers: "Bacillus megaterium, "Bacillus cereus, Glucose, Ammonium sulfate, Biotin, Photoelectric colorimetry, Phase contrast microscopy, Substrate utilization.

microscopy, Substrate utilization.

A study of the nutritional requirements of Bacillus megaterium and Bacillus cereus involved an assessment of growth by photoelectric colorimetry, nutritional requirements by standard techniques, and total and viable counts by phase-contast microscopy. Out of nine strains of Bacillus megaterium from culture collections, only five grew in a minimal medium that contained glucose and anamonium sulphate as principal nutrients. One strain required biotin, while three other strains required two or more amino acids for growth. A freshly isolated strain of B. megaterium required three amino acids for growth. Three strains of Bacillus cereus from a culture collection each required two or more amino acids for growth. From two of these strains, substrains independent of amino acids were developed by serial transfers. Ability to grow in a minimal medium is therefore not so valuable as a distinction between B. megaterium and B. cereus as previously had been supposed. (Byrd-Battelle)

FACTORS AFFECTING THE CONCENTRA-TION OF FAECAL BACTERIA IN LAND-DRAINAGE WATER, West of Scotland Agricultural Coll., Auchincruive (Scotland). Dept. of Microbiology. For primary bibliographic entry see Field 05B. W73-01664

SCATTERING LAYERS AND VERTICAL DIS-TRIBUTION OF OCEANIC ANIMALS OFF OREGON, Oregon State Univ., Corvallis. Dept. of Oceanog-

region state of Mr., Colvains, Dept. of Oceanography.

W. G. Pearcy, and R. S. Mesecar.

Available from the National Technical Information Service as RLO-1750-65, \$3.00 in paper copy, \$0.95 in microfiche. Report No RLO-1750-65, 1970. 16 p. 9 fig. 1 tab, 16 ref. Contract No AEC AT (45-1)-1750.

Descriptors: *Marine animals, *Oregon, *Sounds, Biomass, Depth, Electronic equipment, Spatial distribution, Sampling, Nekton, Shrimp, Marine fish, Equipment, Trawling, Vertical migration, Variability.

Identifiers: *Scattering layers, *Vertical distribution, Lanternfishes, Stenobrachius leucopsarus, Diaphus theta, Tarletonbeania crenularis, Melanostomiatidae, Tactostoma macropus, Sergestes similis, Euphausia pacifica, Euphausiids, Echosounders, Sergestidae, Lensia.

Some of the distributional features of vertically migrating micronekton off Oregon are reviewed. A new conducting cable-midwater trawl system using an eight net opening-closing codend unit is described, and some preliminary results are presented on trawl catches relative to sound scatering layers. A variable complex of organisms, including euphausiids, a sergestid shrimp, and mesopelagic fishes were often common in 12 and 38.5 kHz scattering layers. The depth range of many species was broad, and sometimes largest

catches were made at depths above or below scat-tering layers. Variability was large among nets fished either horizontally or vertically during sin-gle tows. (Byrd-Battelle) W73-01671

ECOLOGICAL OBSERVATIONS ON THE BENTHIC INVERTEBRATES FROM THE CENTRAL OREGON CONTINENTAL SHELF, Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 05A. W73-01672

SURFACE ZOOPLANKTON FROM AUKE BAY AND VICINITY, SOUTHEASTERN ALASKA, AUGUST 1962 TO JANUARY 1964, National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Fisheries Lab.
For primary bibliographic entry see Field 05A.
W73-01677

THE RESPONSES OF THE BIOTA OF LAKE WABAMUN, ALBERTA, TO THERMAL EF-

WABAMUN, ALBERTA, TO THERMAL EF-FLUENT, Alberta Univ., Edmonton. Dept. of Zoology. J. R. Nursall, and D. N. Gallup. In: Proceedings of the International Symposium on the Identification and Measurement of En-vironmental Pollutants, Ottawa, p 295-304, June 1971. 6 fig, 2 tab, 23 ref.

Descriptors: "Biota, "Temperature, "Canada, "Lakes, "Thermal pollution, Water pollution, Cooling, Thermal powerplants, Heated water, Circulation, Infrared radiation, Hydrography, Plankton, Algae, Environmental effects, Biological community, Canada.
Identifiers: "Lake Wabamun, Biological studies,

Macrophytes.

Two power-generating plants put water from con-denser-cooling systems into Lake Wabamun at temperatures 8 - 14 C above ambient. The input represents about 0.5 percent of the lake volume represents about 0.5 percent of the lake volume per day when averaged over the year. Circulation restricts the heated water to the east end of the lake, thereby localizing its effects. Infra-red imagery has been used to support detailed direct thermometry. Discussed are the effects of heated effluent on planktonic algae, several species of macrophytes, five species of rotifers and four species of planktonic crustaceans. Noted in particular are the wide distribution of Elodea canadensis in cies of planktonic crustaceans. Noted in particular are the wide distribution of Elodea canadensis in the heated zone, concentration of Potamogeton pectinatus in the effluent canal, reduction in numbers of Diaptomus oregoneasis in the heated zone, and variation in numbers and egg ratios for planktonic rotifers between the heated and unheated regions of the lake. (Oleszkiewicz-Vanderbilt) W73-01704

ENGINEERING FOR RESOLUTION OF THE ENERGY-ENVIRONMENT DILEMMA: A SUM-MARY. National Academy of Engineering, Washington, D.C.

Final Report of Committee on Power Plant Siting, 1971. 51 p, 1 fig, 3 tab, 32 ref. NSF-C310, T. O. 204.

Descriptors: "Powerplants, "Locating, Thermal pollution, Environmental effects, Radioactive wastes, Radioactivity, Research and Development, Water pollution, Air pollution, Electric power demand, Electric power production, Hazard, Sites.

Identifiers: "Powerplant siting, Committee on powerplant siting.

Conflicts between environmentalists and electric power utilities over power plant siting issues have

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been publicized widely in recent months; they are examples of difficulties which can develop in the utilization of technology with changing value judgments regarding the side effects which accompany the benefits desired. The urgent and precedent-setting problem of power plant siting, an area in which the need for coaflict resolution is urgent, is discussed. A procedure of mitigating power plant siting conflicts, is proposed which, if implemented, could become effective in the relatively near future. There are also identified research and development projects which if pursued might contribute to minimizing the present conflict to a substantial degree within a decade or so. Finally, considerable information directly relevant to the energy - environment crisis is included in the reports of the Working Groups. This material was previously unavailable in a convenient single source. Working groups reported on air quality, water quality, radiological and nesthetic aspects of power plant siting and the systems engineering approach for locating power plants. (Oleazkiewicz-Vanderbilt)

MACROINVERTEBRATES OF THE MISSISSIP-PI RIVER IN THE MONTICELLO REGION, Saint Cloud State Coll., Minn. Dept. of Biology. For primary bibliographic entry see Field 05B. W73-01708

THERMAL POLLUTION OF A TROPICAL MARINE ESTUARY, Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla. R. G. Bader, M. A. Roessler, and A. Thorhaug. Paper presented at FAO Technical Conference on Marine Pollution and its Effects on Living Resources and Fishing, Rome, Italy, December 9-18, 1970, Food and Agriculture Organization of the United Nations Report FIR:MP/70/E-4, WM/A7446, Rome, Italy, 1970. 6 p, 6 fig, 6 ref.

Descriptors: *Thermal pollution, *Estuaries, *Temperature, Shrimp, Lobsters, Crabs, Fish, Florida, Heat resistance, Thermal powerplants, Aquatic populations, Food chains. Identifiers: *Turkey point plant, Biscayne Bay, Macroalgae, Seagrass, Species diversity index.

Macroalgae, Seagrass, Species diversity index.

Tropical estuaries are nursery grounds for penacid shrimp, lobsters, crabs, clupeid fishes and caicenid fishes which constitute vast food supplies and high value fisheries. Circulation patterns, chemical variables and quantitative estimates of the diversity and abundance of the biota have been investigated for the past two years at 32 stations in the area of a power plant near Turkey Point, Florida. The iron content of the effluent is higher than that of surrounding waters and organic floculent material causes increased turbidity. Other mutrients and chemicals fall within the ranges expected in tropical estuaries. Macro-algae and the turtle grass (thalassia testudinum) have disappeared from an area of 20-25 h off the mouth of the effluent canal and have been replaced by a mat of blue green algae which does not provide food suitable for most estuarine animals. Laboratory studies gave thermal limits for chlorophytes, green macroalgae, and invertebrate adults and larvae. Sustained temperatures above 33 C can cause extensive mortalities of some of the most important macroalgae and sea grasses. This may eliminate the major food source and shelter for a great number of herbivores and detrius feeders including juvenile shrimp, lobsters fishes. The resulting loss of the carnivores can decrease the value of the area for fishing and recreation. (Upadhyaya-Vanderbilt)

THERMAL ACCLIMATION IN AUSTRALIAN AMPHIBIANS, California State Coll., Fullerton. Dept. of Biology.

Comparative Biochemistry and Physiology, Vol 35, No 1, p 69-103, July 1, 1970. 33 fig, 4 tab, 25

Descriptors: "Amphibians, "Temperature, "Bioassay, "Animal behavior, Environmental effects, Efficiencies, Biology, Biodiciators, Water pollution, Thermal pollution.
Identifiers: "Australia, "Thermal acclimation, Temperature variations, Onset of spasma (OS), Critical thermal maximum (CTM), Survival, Progs, Temperature effects.

Critical thermal maxima, onset of spasms, hot and cold lethals and rate and range of acclimation have been determined for forty-two species of anurans from a wide variety of habitats, latitudes and altitudes along the east coast of Australia. Cryophylic anurans are more southern and thermophylic anurans more northern in distribution, though both stenothermic and eurythermic frogs may occur at any latitude. Species with restricted geographic ranges have little or poor ability to physiologically adjust. Species with wide ranges of adaptability have the widest geographic range. (Oleszkiewicz-Vanderbil)

THERMAL POLLUTION AND ITS TREATMENT - THE IMPLICATIONS OF UNRESTRICTED ENERGY USAGE WITH SUGGESTIONS FOR MODERATION OF THE IM-

GESTIONS FOR MODERATION OF THE IM-PACT,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
R. T. Jaske.
Available from the National Technical Informa-tion Service as BNWL-SA-3381, 33.00 in paper copy, 80,95 in microfiche. In: Session notes of En-vironmental Management for Industry and Government, Training course sponsored by Indus-trial Management Center, Austin, Texas, 1970-71 Sessions, October 7, 1970. 31 p, 7 fig, 2 tab, 14 ref. AEC AT (45-1)-1830.

Descriptors: *Thermal powerplants, *Electric energy demand, *Thermal pollution, Powerplants, Cooling, Water pollution, Heat, Temperature, En-vironmental effects, Pumped storage, Beneficial use, Waste water treatment. Identifiers: *Canal-lake cooling system, *Waste heat, Heat sink, Heat dissipation.

heat, Heat sink, Heat dissipation.

Problems of unlimited and controlled increase of energy demand and methods of satisfying the demand as well as the impact of the methods on the environment in the United States are considered in detail. Pollowing a brief discussion of various types of cooling in the Pacific Northwest i.e. (1) ponding or direct discharge to natural water bodies; (2) cooling towers, and (3) dry towers, attention is focused on a new proposed canal-lake cooling system. It consists of a series of either natural or artificial waterways covering an extensive distance and providing a central power network for redirecting the growth of population centers. The canal system could also provide supplementary flow as a water supply for the new cities and industries along the route, as well as local transportation and navigation, where desirable. Its principal objective would be to provide an extended heat sink away from presently regulated public water courses, capable of supporting large thermal stations all along the route. (Oleszkiewicz-Vanderbilt)

THE TROPHIC INTERRELATIONS BETWEEN TWO ITALIAN RIVERS: THE PO AND THE GARIGLIANO (IN ITALIAN), Milan Univ. (Italy). Laboratorio di Zoologia. E. Tibaldi.

E. Tibaldi.
Atti Accad Naz Lincei Redn Cl Sci Fis Mat Nat Sez III. Vol 50, No 4, p 482-486. 1971. Illus. English summary.
Identifiers: "Garigliano River, "Po River, Rivers, Trophic level, Eutrophication.

A description of the trophic structure of the Po and Garigliano Rivers is presented. The food-web of the Garigliano River, in general, appears to be more 'open,' while that of the Po River seems more complex but not as rich in energy output. The importance of human activity on the 2 ecosystems is discussed.—Copyright 1972, Biological Abstracts, Inc.
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THERMAL EFFECTS OF PROJECTED POWER GROWTH: MISSOURI RIVER BASIN, Hanford Engineering Development Lab., Richland, Wash. For primary bibliographic entry see Field 05B. W73-01724

HYDRODYNAMIC CHANGES IN THE CHES-APEAKE BAY, Hampton Roads Sanitation District, Norfolk, Va. W. J. Love.

Journal of the Washington Academy of Sciences, Vol 62, No 2, p 118-121, June 1972.

Descriptors: *Chesapeake Bay, *Environmental effects, *Water pollution effects, *Sedimentation, Erosion, Landfills, Waste disposal, Urbanization, Water resources development, Estuaries, Bays, Water reso Maryland.

Maryland.

Past and present physical changes in the configuration of Chesapeake Bay, and their impact upon the hydrodynamics of the Bay, are discussed. Included are natural and manmade influences which have altered the Bay, and a projection of what may be expected in the future. It is where long-term, very slow acting processes of nature are overridden and supplemented by the works of man that we may find indications of trouble. Hydrodynamic changes brought on by all loadings, aggravated by urban development, by samitary waste disposals in a not necessarily sanitary fashion, by urban community development surrounding the Bay, and by haphazard, if not reckless dredging and filling operations for private, municipal or corporate interests, provide changes in a handful of years that nature could not duplicate in many centuries. These stresses are local in nature, far from uncontrollable, and may be satisfactorily brought into rational balance if intelligent decisions can be made. (Knapp-USGS)

SEDIMENTATION AND HYDROELECTRIC

DEVELOPMENT, Army Engineer District, St. Louis, Mo., Planning Branch. J. F. Rass

Journal of the Power Division, American Society of Civil Engineers, Vol 98, No PO2, Paper 9254, p 313-321, October 1972. 1 fig, 1 tab.

Descriptors: *Sedimentation, Water resources development, *Flarbors, *South Carolina, *Environmental effects, Dredging, Hydroelectric power, Hydrology, Sediment transport, Water pollution effects. *Charleston Harbor (SC).

Stream diversion and power development studies must investigate all aspects of surrounding regimens. In the case of the harbor at Charleston, South Carolina, federal expenditure of about 33,000,000 annually is needed for maintenance dredging, largely to correct density current regimen set up as a result of upstream hydroelectric development. Solution to the problem entails rediversion of a major river to cause readjustment to past regimen patterns. The planner-designer in the hydrodevelopment field must be constantly aware of the disturbance to the ecosystem that development might cause. (Knapp-USGS)

ENTERIC BACTERIAL DEGRADATION OF

ENTERIC BACTERIAL DEGRADATION OF STRRAM DETRITUS, Georgia Univ., Athens. Dept. of Microbiology. C. W. Hendricks. Copy available from GPO Sup Doc EP1.16:16050 EQS 12/71, \$1.00; microfiche from NTIS as PB-213 120, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, December 1971. 105 p, 24 fig, 33 tab, 58 ref. EPA Program 16050 EQS 12/71.

Descriptors: *Enteric bacteria, *Degradation (Decomposition), *Streams, *Detritus, Nutrients, Bottom sediments, Water quality, Water pollution effects, Pathogenic bacteria, Bacteria, Salmonel-la, Colitorms, Shigella, Public health, E. coli Identifiers: *North Oconee River (Ga.), Bdelovibrio bacteriovorus, Enterobacter aerogenes.

To relate basal autrients in the water and on the bottom of a warm, fresh water stream to their ability to support growth and multiplication of pathogenic and nonpathogenic enteric bacteria, three studies were designed including a river water quality analysis, respiration experiments, and continuous culture experiments. The presence of coliform bacteria primarily not producing intestinal disease, serves as indicators for potentially infectious microorganisms. Any growth by either coliform bacterial group or the disease producing organisms in the natural aquatic environment could significantly alter our present concepts of detection and surveillance of these organisms. Tests in detecting and analyzing polluration potential, showed that Oconee River, a typically non-polluted stream of the North Georgia piedmont, is capable of supporting bacterial growth innon-polluted stream of the North Georgia pied-mont, is capable of supporting bacterial growth in-cluding coliforms. Both organic and inorganic compounds can be adsorbed by bottom sediments and some, after removal, can be used as food for both coliform and intestinal disease producing bacteria. If intestinal pathogenic bycteria such as Salmonella, Shigella, and Arizona can reach our streams and multiply, chances of human disease from the untreated or partially treated water are increased. (Jones-Wisconsin)

THE LONG TERM EFFECT OF NATURAL URANIUM ON THYROID FUNCTION, Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).

Muscow (USAR). L. L. Rezanov. Hygiene and Sanitation, Vol 33, No 8, p 209-215, Aug. 1968. 1 fig, 2 tab, 15 ref.

Descriptors: Water treatment, *Public health, *Potable water, Water pollution effects. Identifiers: *Thyroid glands, *Uranium.

The effect of uranium in drinking water on the thyroid and parathyroid glands and the sexual maturation of female albino rats was studied. In long-term use of drinking water containing uranism at a concentration of 0.6 mg/l, the functioning of the thyroid gland was diminished and that of the parathyroid glands increased. There was a delay of the sexual maturation when the uranium content of water was at a level of 6 mg/l and more. (Bean-AWWARF) W73-01821

THE NEED FOR LIMITING THE SILVER CON-THE NEED FOR LIMITING THE SILVER CONTENT OF DRINKING WATER,
Ministerstvo Zdravookhraneniya SSSR, Moscow.
G. D. Barkov, and L. I. El'piner.
Hygiene and Sanitation, Vol 33, No 6, p'314-319,
June 1968. 2 fig, 2 tab, 9 ref.

Descriptors: *Water treatment, *Water quality, *Poblic health, *Standards, Toxicity, *Potable water, Water pollution effects. Identifiers: *Silver.

Investigation data are presented on the toxicologic effect of silver (electrolytic) on experimental animals (mice, rats and rabbits) in its introduction into the body with drinking water. Silver at a concentration of 0.05 and 0.005 mg/l was practically ineffective. This should be born in mind in the long-term use of drinking water decontaminated with silver. (Bean-AWWARF)

THE PART PLAYED BY WATER IN THE RRANSMISSION OF LEPTOSPIROSIS IN THE NORTH OSSETIAN ASSR, North Ossetian Republican Sanitary-Epidemiological Center, Ordzhonikidze (USSR).

M. Kh. Aguzarova, and A. I. Bondarev. Hygiene and Sanitation, Vol. 33, No 6, p 310-313, June 1968. 1 tab, 8 ref.

Descriptors: Water quality, Sanitary engineering, "Public health, "Epidemics, Infection, "Human diseases, Potable water, Water pollution effects. Identifiers: "Leptospirosis infections, "North Osetian ASSR

In the North Osetian ASSR water is the main route for dissemination of leptospirosis infection, and this determines its seasonal incidence (June-August), the age of the sick (72.9%, from 2 to 14 years old) and also its prevalence among the rural population living in areas sited near surface water bodies. In 95.7% of the sick the infection was water-borne. In 94.1% of the water-borne infection cases the diseases occurred after bathing or wad-face waters in the spread of leptospirosis infection was proved by recovery of Leptospirosis infection was proved by recovery of Leptospira cultures (type Pomona) from the surface water in 1964-1965. (Bean-AWWARF)

THE VALUE OF E. COLI AS AN INDICATOR OF ADENOVIRUS CONTAMINATION, Akademiya Meditsinskikh Nauk SSSR. For primary bibliographic entry see Field 05F. W73-01826

BANCROFTIAN FILARIASIS IN TWO VIL-LAGES IN DINAJPUR DISTRICT, EAST PAKISTAN: II. ENTOMOLOGICAL IN-VESTIGATIONS.

VESTIGATIONS,
Pakistan Medical Research Center, Lahore.
M. Aslamkhan, and M. S. Wolfe.
Am J Trop Med Hyg. Vol 21, No 1, p 30-37. 1972.
Illus.
Identifiers: "Bancroftian bilariasis, Cardiofilaria
Nilesi, Cattle, Culex-Pipiens-Fatigans, "Mosquito
larva, Culex-Vagans, Culex-Visnui, "Dinajpur district (Pakistan), Entomological investigations,
"Pakistan (East), Setaria, Vectors, Villages.

In 2 villages in a non-urban focus of nocturally periodic bancroftian filariasis in Thakurgaon thana, Dinajpur District, East Pakistan, Culex pipiens fatigans was the principal vector. Infective mosquitoes were found during 6 mo. of the yr, correlating with other clinical and climatic criteria for a highly endemic focus. These mosquitoes were never found biting cattle. Larvae of this species were found throughout the year in small polluced domestic water collections. Mosquitoes of the C. vishnui complex were minor vectors of bancroftian filariasis. Infective larvae thought to be Setaria were found in 3 other mosquito species and infective larvae identical to the bird filarioid, Cardiofilaria nelesi were present in C. vagans mosquitoes.—Copyright 1972, Biological Abstracts, Inc.

GROWTH OF WHITE CRAPPIE AND GIZZARD SHAD IN LAKE KEYSTONE, OKLAHOMA, Oklahoma State Univ., Stillwater, Dept. of Zoolo

T. R. Al-Rawi, and D. W. Toetz. Proceedings of the Oklahoma Academy of Science, Vol 52, pl.5, 1972. 2 fig, 5 tab, 11 ref. A-001-0KLA (2)OWWR.

Descriptors: Fish establishment, *Fish popula-tions, *Growth rates, *Oklahoma, Baseline stu-dies, On-site data collections, Reservoir fisheries, Impousaments.

*White crappie, *Shad, Crappie, Gizzard shad, Pomoxis spp., Dorosoma spp., Fish growth, *Lake Keystone (Okla).

White crappie, Pomoxis annularis, grew more slowly in Keystone Reservoir during the first three years after impoundment than in other newly impounded waters in Oklahoma. The growth of gizzard shad, Dorosoma cepedianum, decreased during the first three years. Length-frequency historams sugagest that two discrete populations of gizzard shad coexisted in Salt Creek Cove of the lake during 1967. Gizzard shad exhibited the reverse of Lee's phenomenon, i.e. older fish tend to have greater calculated lengths than do younger fish at the same annuli. (LeGore-Washington) W73-01892

EFFECTS OF AN ACID AQUEOUS ENVIRON-MENT ON THE METABOLISM OF ESCHERICHIA COLI AND RHODOTORULA ESCHERICHIA COLI AND RHODOTORGEA MUCILAGINOSA, West Virginia Univ., Morgantown. F. C. Thompson. Ph.D. Dissertation, 1972. 127 p, 38 fig, 20 tab, 62 ref. OWRR-A-018-WVA (1).

Descriptors: *Water pollution effects, *Acid min Descriptors: "Water polition enecus, Acia mine water, "Hydrogen ion concentration, "Iron compounds, Water pollution sources, Acidic water, Waste water (Pollution), Iron bacteria, Water quality, Aquatic bacteria, E. coli, Iron, Tritium, Microbial degradation, Pollutants.

Identifiers: "Microbial physiology, Rhodotorula

Acid mine drainage flowing into streams creates an acid environment which kills or impedes most of the indigenous microbial population of the streams. Aciduric bacteria and fungi, particularly yeasts, remain as the dominant flora under such conditions. In that microorganisms are responsible for the degradation of organic debris in streams, the loss of a portion of the microflora would reduce the rate of degradation of the debris. The purpose was to study some of the effects of high pH and/or iron concentrations on selected microorganisms and to determine if the hydrogen ions and the iron concentrations influence the ability of E. coli and R. mucilaginosa to utilize nutrients in sewage. Substantial numbers of R. mucilaginosa survived and metabolized over a greater pH range than did E. coli. Both species possessed sufficient endogenous nutritional reserves to permit survival through periods of nutrient unavailability. Increasing iron concentrations were more inhibitory to the growth of E. coli than to R. mucilaginosa. (LeGore-Washington)

AN INVENTORY AND EVALUATION OF THE AN INVENTORY AND EVALUATION OF THE GAME AND FISH RESOURCES OF THE UPPER GREEN RIVER IN RELATION TO CURRENT AND PROPOSED WATER DEVELOPMENT PROGRAMS, Wyoming Univ., Laramie. N. A. Binns. Ph.D. Dissertation, January 1972. 196 p, 70 fig, 25 tab, 106 ref. OWRR B-002-WYO (1).

Descriptors: "On-site data collections, "Creel cen-sus, "Surveys, Sport fish, "Baseline studies, "Pre-impoundment, Stream fisheries, Social values, Data collections, "Wyoming, On-site investiga-tions, Terrain analysis, Evaluation, Fish, Wildlife, Recreation, Trout, Sport fishing, Fisheries, Social aspects, Social impact, Value.

Group 5C-Effects of Pollution

Identifiers: Moose, *Green River (Wyoming), Mountain sheep, Antelope, Fisherman satisfac-tion, Satisfaction.

tion, Satisfaction.

From 1967 to 1970, an inventory was made of the wildlife resources of the Upper Green River in Wyoming with the objectives of evaluating the general quality of the wildlife resources and of predicting the effects of water development programs on these resources. The area drew fishermen from at least 35 states, 19 Wyoming towns, and one foreign country, and most users expressed satisfaction with their experiences in the area. The Upper Green River is one of Wyoming's better stream fisheries and the area also supports important game resources. A dam at either the proposed Kendall or New Fork sites would eliminate those stream sections inundated. Because of the resultant change in the type of fishery, and because of possible esthetic changes, the total quality of the fishery might appear to some to have diminished. (LeGore-Washington)

WATER POLLUTION BY OUTBOARD MOTORS AND ITS EFFECTS ON FAUNA AND FLORA (GEWAESSERVERSCHMUTZUNG DURCH AUSSENBORDMOTOREN UND DEREN WIRKUNG AUSSENBURDMOTOREN UND DEREN WIRKUNG AUF FAUNA UND FLORA), Bundesgesundheitsamt, Berlin (West Germany). Institut fuer Wasser-, Boden-, und Lufthygiene. Por primary bibliographic entry see Field 05B. W73-01898

VERTEBRAL DAMAGE TO BLUEGILLS EX-POSED TO ACUTELY TOXIC LEVELS OF PESTICIDES,

PESTICIDES, Environmental Protection Agency, Beltsville, Md. Pesticides Regulation Div. J. A. McCann, and R. L. Jasper. Transactions of the American Fisheries Society, Vol 101, No 2, p 317-322, April 1972. 10 fig, 4 tab,

Descriptors: *Sunfishes, *Pesticide toxicity, Fish, Freshwater fish, Bioassay, Organophosphorous pesticides, Chlorinated hydrocarbon pesticides, Fish diseases, Pathology, Animal pathology, *Toxicity, *Lethal limit, Mortality, Identifiers: Methyl parathion, Parathion.

Bluegill fingerlings, Lepomis macrochirus, exposed to six different pesticide formulations, developed hemorrhaging and fractures of the caudal vertebrae 4-8 hrs after treatment. Fish exposed to Dyrene (registered trademark), Akton (registered trademark), methyl parathion, trichlorfon, phosalone, and demeton developed vertebral injury. Injury was observed at concentrations above and below the LC-50 for each chemical. Disturbance of fish during the early hours of expo-Disturbance of fish during the early hours of expo-sure increased mortality and hemorrhage rates. (LeGore-Washington)

WATER QUALITY CRITERIA FOR EUROPEAN FISH: REPORT ON MONOHYDRIC PHENOLS AND INLAND FISHERIES.

Food and Agriculture Organization of the United Nations, Rome (Italy).

European Inland Fisheries Advisory Commission, Technical Paper No 15, EIFAC/T 15, 1972. 18 p. 2 tab. 99 ref

Descriptors: *Water pollution effects, *Lethal limit, *Phenols, Water pollution sources, Bioasan, Organic compounds, Aromatic compounds, Chemical wastes, Chemicals, Industrial wastes, Water pollution, Toxicity, Water quality, Poisons, Pollutants, Freshwater fish, Salmonids, Fish food organisms, Larvae, Chlorine, *Water quality stan-

Identifiers: *Xylenol, *Cresol, Synergistic effects, Additive effects, Antagonistic effects, Coarse fish.

Phenolic wastes can contain monohydric phenols, including phenol, the three cresol isomers, and the six xylenol isomers, together with other substances. They may adversely affect freshwater fisheries by their direct toxicity to fish and fish food organisms, by their high oxygen demand resulting in oxygen depletion of the receiving water, and by the production of undesirable flavors in the edible flesh of fish. Laboratory tests show that the toxicity of phenol is increased by decrease in dissolved oxygen concentration, increase in salinity, and decrease in temperature. Salmonids and newly batched fish are more sensitive than coarse fish and adults respectively. Cresols, xylenols, and phenols are of similar toxicity, and the toxicity of mixtures of phenols is apparently additive, although the toxicity of phenolic wastes may be greater than expected from chemical analyses, since these may not be equally sensitive to all phenols and may neglect the contribution from other poisons. Where other poisons are present in addition to phenols, due allowance must be made for their contribution to the toxicity, particularly in the case of free chlorine. (LeGore-Washington) Washington) W73-01900

COLLECTION OF PAPERS ON POLLUTION

Collection of papers presented at the meeting of the Ad-hoc Committee on Pollution and Water Quality, American Fisheries Society, December 13, 1971. 111 p, 5 fig, 9 tab.

Descriptors: "Fishkill, "Mortality, "Reviews, "Data collections, "Documentation, "On-site data collections, "On-site investigations, Basic data collections, Water pollution effects, Fish diseases, Water pollution, Wildlife conservation, Investigations, Sampling, Evaluation, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, Ohio, Wisconsin. Identifiers: Reporting, Recording.

There is some divergence in procedures for the investigation of fishkills among the various states. Because a degree of standardization is necessary for comparison of data, this collection of procedures used in many states was compiled. The states of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North and South Dakota, Ohio and Wisconsin are represented. A limited amount of tabulation corening past reported fishkills is presented for several of these states. (LeGore-Washington)

NATIONAL CENTER FOR TOXICOLOGICAL RESEARCH, PINE BLUFF, ARKANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT). Department of Health, Education and Welfare, parument, D.C.

Available from the National Technical Informa-tion Service as EIS-AR-72-4497-F, \$4.00 in paper copy, \$0.95 in microfiche. 1972. 60 p, 1 map, 1 tab, 2 chart.

Descriptors: *Arkansas, *Environmental effects, *Research facilities, *Toxicity, Laboratories, Federal government, Institutions, Research and development, Technology, Testing, Pesticide toxicity, Public health, Safety, Toxins, Chemical properties, Wastes, Waste disposal, Chemical wastes.

Identifiers: *Environmental Impact Statements, *Pipes Bluff (Arkansa).

*Pine Bluff (Arkansas).

The National Center for Toxicological Research will be established at Pine Bluff Arsenal, Arkanas, to conduct research programs to study the biological effects of potentially toxic chemical substances found in man's environment. Project studies will emphasize: (1) determination of adverse health effects resulting from long term, low level exposure to chemical toxicants; (2) determination of the metabolic processes by which chemical toxicants are detoxified in animal organisms; (3) development of improved methodologies and testing procedures for evaluation of the safety of chemical toxicants; and (4) development of data that will facilitate the interpretation and extrapolation of toxicological data acquired from laboratory animals to men. The project will result in minor discharges of effluents from solid and sanitary waste disposal. All solid wastes generated during biological operations will be disposed of in an incinerator that will meet federal and local regulations. Research wastes requiring special handling will be disposed of or independently treated by a process to be prescribed by the Center's safety officer. Other anticorrosion chemical wastes and research wastes will be disposed through the industrial sewage system. Alternative sites were considered and found less feasible than the one chosen. (Ellis-Florida)

5D. Waste Treatment Processes

PARTICLE SEDIMENT IN CURVED PATH Clemson Univ., S.C. Dept. of Engineering Mechanics. For primary bibliographic entry see Field 02J. W73-01306

RECOVERY OF SMALL QUANTITIES OF VIRUSES FROM CLEAN WATERS ON CELLU-LOSE NITRATE MEMBRANK FILTERS, Environmental Protection Agency, Cincinnati, Ohio. Water Quality Office. G. Berg, D. P. Dahling, and D. Berman. Applied Microbiology, Vol 22, No 4, p 608-614, October 1971. 7 tab, 20 ref.

DETE

Ti la sa folo Po co tu w sa o co lo lu S. lo lo ar ma de du To W

CI WHI W.T. In ter

Descriptors: *Viruses, *Membranes, *Filters, Ter-tiary treatment, *Waste water treatment, Hydrogen ion concentration. Identifiers: *Celluloue nitrate membrane filters, Polioviruses, *Sonic treatment.

Complete virus recovery in membrane filter techniques has been prevented by poor elution efficiencies. High frequency sonic treatment of the eluent raises the efficiency to near 100 percent in clean waters. The method consists of adsorbing viruses onto cellulose nitrate membrane filters viruses onto cellulose nitrate membrane filters (0.45 micromillimeter pore size) from water containing enough Na2HPO4 to produce a molarity of 0.05 and enough citric acid to adjust the pH to 7. The viruses are then eluted in three percent beef extract under twenty minutes sonic treatment. Complete recovery of poliovirus 1, echovirus 7, and coxsackievirus B3 resulted. Recovery of and coxsackievirus B3 resulted. Recovery of reovirus was almost as good. The sonic vibrations appear to increase the permeation of the eluent into the narrow filter pores, helping to liberate entrapped virions. Preliminary data suggest that volumes as large as twenty-five gallons may be filtered, but the procedure is unsatisfactory for waters containing certain organic constituents. (Anderson-Texas) W73-01340

AN ADVANCED WASTEWATER TREATMENT PLANT CAN PROVIDE REVENUE, J. C. Hild.

Public Works, Vol 103, No 7, p 49-50, July 1972.

Descriptors: "Tertiary treatment, "Cost analysis, Texas, "Waste water treatment, "Treatment facili-ties, Biological treatment, Activated sludge, Sludge digestion.

Identifiers: *Contact stabilization, Dual-media filters, *Houston (Tex).

ters, *Houston (Tex).

Houston has the first tertiary treatment plant whose chief components are a factory-built, field-erected contact stabilization plant and three gravity dual-media type filters. It provides maximum reatment in minimum area. Also the contact stabilization process requires less tank volume and hence also lower equipment cost. The major components are built by Ecodyne Corporation's Smith and Loveless affiliate. Biological treatment is handled by their Model 97-R-1000 Oxigest in which the raw sewage mixes with activated sludge. After settling this mixture for a period of about four bours in its clarifier portion, the overflow is passed to the dual-media filters, and the underflow or activated sludge is entered into the reaeration area. Excess sludge withdrawn into the aerobic digester portion of the Oxigest, after being processed, is passed to the sludge concentrator where it will reduce to dry solids at the rate of 300 pounds per hour. The tertiary stage consists of three Smith and Loveless Model T-3-300 gravity dual-media filters, about 11 ft. high and 12 ft. in diameter with anthracite and sand layers each 18 inches deep. The effluent quality is far above state requirements. Switches at a single nanel permit diameter with antifractie and sand layers each 18 inches deep. The effluent quality is far above state requirements. Switches at a single panel permit control of aeration tank blowers, settling basin skimmers, the sludge concentrators and filter pumps. (Morparia-Texas) W73-01341

EFFECTS OF SEWAGE LOADING ON THE PREVALENCE OF SPHAEROTILUS NATANS, Rensselaer Polytechnic Inst., Troy, N.Y.
Rao S. Sathyanarayana, and D. R. Washington.
Applied Microbiology, Vol 16, No 4, p 942-943, Instal 1962, 1 stab. Applied Micro-June 1968, 1 tab.

Descriptors: *Activated sludge, *Sewage treatment, Trickling filters, *Waste water treatment, *New York, Biological treatment. Identifiers: *Sphaerotilus natans, *Troy (NY).

The results of an investigation performed on four laboratory activated sludge units operated on the same chemically defined media are reported in the form of a table. The four units received an organic form of a table. The four units received an organic load of 1, 5, 10 and 20 lbs. per 1000 cu. ft. per day. Petroff-Hausser bacteria counting chamber has been used to periodically analyze each system, per cent viable counts were determined by a slide culture technique and Sphaerotillus natans counts were made with Casitone-glycerol-yeast autolysate medium. S. natans were distinguished from other organisms by examination under a Quebec colony counter. A close correlation between the leading factor and the development of Sphaeroti. colony counter. A close correlation between the loading factor and the development of Sphaerotilus natans has been concluded, the population of S. natans being greater under conditions of low loading. Filter clogs in both underloaded and overloaded trickling filter units in Troy, New York, area have higher concentrations of sphaerotilus natans show a definite correlation between development of S. natans and sludge formation during biological treatments of sewage. (Morparia-Texas) Texas 773-01342

CLOSED-LOOP RECYCLING OF PLATING WASTES,
Heil Process Equipment Corp., Cleveland, Ohio.
Waste Treatment Dept.
T.J. Kolesar.
Industrial Finishing, Vol 48, No 9, p 22-25, September 1972. 1 fig, 1 tab.

Descriptors: *Recycling, Waste water treatment, Industrial wastes, Water reuse, Costs. Identifiers: *Plating wastes.

One of the recent developments in recycling - Evaporative Atmospheric Recovery System - has been reviewed in light of current stricter pollution control standards and TDS (Total Dissolved Solids) code proposals. A typical chrome closed-loop Evaporative Atmospheric Recovery System is described. The cost of such a system for a plating plant depends on individual installation and the type of plating involved; the main factors being the rinse flow-rate and the rate of steam consumption. Definite economic gain without affecting process efficiency has been argued and is so justified by quoting the comparative operating costs of plating rinse treatment at a plant of an automative parts supplier. The Atmospheric Recovery System also makes efficient use of raw materials, thus saving the natural resources for future use. (Morparia-Texas)

HUMAN WASTES AND THE CHESAPEAKE BAY, Marviand Environmental Service, Annapolis.

T. D. McKewen.

Journal of the Washington Academy of Science, Vol 62, No 2, p 157-160, 1972.

Descriptors: *Sewage treatment, *Chesapeake Bay, Water pollution, Waste water treatment, In-dustrial wastes, Tertiary treatment, Water pollu-

Chesapeake Bay is considered to be a relatively clean body of water, but with the population increase expected, public awareness and additional treatment is needed to improve the existing quality. Sewage and industrial waste, currently treated to remove BOD are the main contributors. Tertairy treatment to remove nutrients will soon be needed to protect the fisheries from overen-richment. With improved treatment of sewage and industrial wastes, surface runoff will become more visible. These pollutants are similar in nature to industrial wastes, surface runoff will become more visible. These pollutants are similar in nature to sewage but are difficult to treat because of their diffuse nature. Sedimentation originally a natural process, has been carelessly enhanced to the point of clogging backwaters of the bay. These diffuse pollutants will be the limiting factor in water quality as point source pollutants are controlled. (Anderson-Texas)

American Society of Civil Engineers, Vol 98, No IR 3, p 419-432, September 1972. 7 fig, 3 tab, 12

Descriptors: *Waste water reclamation, *Water demand, Sewage, Industrial wastes, Water quality, *California, *Water reuse, Regions. Identifiers: San Diego (Calif).

In 1949, the California legislature first began steps to include reclaimed waste water as an additional water source. The many waste streams of southern California, varying widely in quality, can be used for irrigation, industrial washings, injection into water tables and a variety of other uses. By the year 2020, reuse will be much more attractive as there is a predicted deficiency in available freahwater supplies. Extensive reclamation will require more information on total waste production, feasibility and cost, and public acceptance. Reclamation can be the most economical method of disposal as opposed to the cost of constructing new trunk sewers, treatment plants, and ocean outfalls. The environmental improvement aspects make reclamation attractive even to agencies who have adequate fresh water supplies. The double have adequate fresh water supplies. The double activity of water supply and disposal has created new agency organization patterns and has stimulated active research and development by mu-nicipalities such as San Diego. Numerous reclama-tion projects now in operation are presented in tabular form for comparison. (Anderson-Texas) W73-01347

COMPUTERIZED MONITORING SYSTEM HELPS SAN FRANCISCO CONTROL OVER-FLOW. For primar W73-01349 ry bibliographic entry see Field 05G.

MAGNETIC RECOVERY OF PERROUS METALS FROM REFUSE,
Mecal (Australian) Ltd., Melbourne.
For primary bibliographic entry see Field 05E. For primar W73-01351

A METHODOLOGY FOR SELECTING AMONG WATER QUALITY ALTERNATIVES, Florida Univ., Gainesville. G. S. Nicholson, Jr.

G. S. Nicholson, Jr. Available from University Microfilms, Ann Arbor, Michigan, Order No 70-12250, Xerox Copy \$8.80, Microfilm, \$4.00. Ph. D. Dissertation, 1969.

Descriptors: "Cost analysis, "Waste water treat-ment, "Water quality, Mathematical models, Reservoirs, Dissolved oxygen, Model studies, "Dynamic programming.

A cost analysis is presented for competing alternatives of waste water treatment to minimize industrial and municipal expenditures. In the case of a municipality downstream from a reservoir, alternatives, especially an auxiliary unit, are examined. The concept of water quality tradeoff in reservoirs which thermally stratify during summer months is presented and demonstrated. Methodology requires a two-dimensional dynamic programming algorithm for the optimization technique. Several water quality models are needed to determine the reservoir release temperatures, the downstream emperature profiles, and the DO response to waste loads. Detailed analyses of the various models are presented. A stochastic DO formulation permits determination of waste loads that models are presented. A stochastic DO formula-tion permits determination of waste loads that satisfy the stream standard with a given probabili-ty. A test case illustrates the methodology, and in-cluded in the case is the verification of temperature models used. The methodology is shown to be sensitive to the deoxygenation coefficient and it is scansive to the deoxygenation coefficient and it is concluded that a good estimate of the coefficient is needed for obtaining reliable cost comparisons. (Anderson-Texas) W73-01325

MANHATTAN GOES MODERN, Black and Veatch, Kansas City, Mo. R. E. Strain, and J. H. Robinson. Water and Wastes Engineering, Vol 9, No 7, p 26-28, July 1972. 2 fig. 1 tab.

Descriptors: "Waste water treatment, "Kansas, "Treatment facilities, Design, Oxidation, Carbon dioxide, Iron, Costs, Filters.
Identifiers: "Plant operations, Plant design, "Manhattan (Kan).

The new Manhattan, Kansas water treatment plant, eye-pleasing in design, has a 10 mgd capacity, expandable to 24 mgd. Iron oxidation and CO2 removal occurs in the all aluminum aerator. A solids-contact upflow basin equipped for sludge recycle softens the water and removes the iron. The four dual-media filters are equipped with pneumatic butterfly valves and sophisticated control consoles. Provisions were made for adding lime, ferric sulfate, chlorine, fluoride, and polyphosphate at various points in the plant. Typical analysis of the filter effluent shows calcium hardness of 60, total hardness of 86, P-alkalinity of

Group 5D—Waste Treatment Processes

20, M-alkalinity of 64 mg/l equivalent calcium carbonate, and a pH of 9.3. The problem of high level distribution was solved by a new pump system, also designed for easy expansion. A summary of construction costs and a list of major contractors and suppliers is presented. (Anderson-Texas) W73-01354

NEW REVERSE OSMOSIS SYSTEM DESIGNED FOR LONG LIFE AND HIGH PERFORMANCE. For primary bibliographic entry see Field 03A. W73-01352

PER CAPITA LOADINGS OF DOMESTIC WASTEWATER, Marquette Univ., Milwaukee, Wis. Dept. of Civil Engineering. For primary bibliographic entry see Field 05B. W73-01357

THE VALIDITY OF USING PURE OXYGEN IN WASTEWATER TREATMENT, Kansas Univ., Lawrence. Dept. of Civil ngineer-

ing. A. A. Thomopulos. Master's Thesis, May 1971. 107 p, 29 fig, 6 tab, 14 ref, 3 append.

Descriptors: *Oxygenation, *Aeration, *Waste water treatment, *Activated sludge, Sewage, water treatment,
*Sludge treatment.

In order to determine the validity of using pure oxygen in place of air for the treatment of waste water, three activated sludge pilot plant units were constructed and operated in parallel. Unit I utilized pure oxygen in a closed aeration tank, while unit 2 utilized air in a closed aeration tank and unit 3 had the aeration tank open to the atmosphere. It is concluded that: (1) higher organic loading can be tolerated by systems using pure oxygen instead of air, (2) the rate of stabilization of the organic matter is increased in the pure oxygen system, (3) increased loading, beyond a certain limit, may cause the growth of filamentous organisms, regardless of the use of pure oxygen, and (4) more activated studge was produced in the system using pure oxygen than in systems utilizing air. (Smith-Texas)
W73-01359 utilized air in a closed aeration tank and unit

PRACTICAL EXPERIENCE IN THE USE OF POLYELECTROLYTES, Manchester Corp. (England). Waterworks Dept.

J. W. Atkinson. Water Treatment and Examination, Vol 20, No 3, 1971. p 165-169, 2 ref.

Descriptors: *Activated aludge, *Waste water treatment, *Polyelectrolytes, Polymers, *Floccu-lation, Sedimentation, Pilot plants, Laboratory tests. Identifiers: *Wisprofloc 20.

Laboratory and plant scale investigation are described in which polyelectrolytes have been used for water treatment and for sludge conditioning at Manchester Corporation Waterworks. A series of 25 consecutive daily samples of blanket densities at various tank levels were taken to determine the efficiency of flocculant aids. Steady blanket levels were maintained by changing some variables. It was noted that poor quality raw water flocculated more rapidly with Wisprofice 20 than with silica. The height of the blanket was dependent on flow and the type of blanket also appeared to be flow dependent. Various improvements such as use of lower doses of lime, copperas, homogenous and denser blanket and better quality of settled water were noted using Wisprofloc 20 as against silica. The cost of chemical treatment was not higher. The full-scale operation of the plant using Wisprofloc 20 gave the expected results and

recommendations to replace silica with Wisprofloc 20 were made. Three polyacrylamides Magnafloc recommendations to replace silica with Wisprofloc 20 were made. Three polyscrylamides Magnafloc R140, Magnafloc R155 and Polyflok LP were investigated as sludge settlers and conditioners. Laboratory trials suggested the use of Magnafloc R155 as sludge conditioners. It was successful when used on large scales in the plants. Since correction of pH is very critical while using the polyacrylamides, trial and error methods indicated pH 10.5 to be optimum. (Morparia-Texas) W73-01360

AN INVESTIGATION INTO THE DEVELOP-MENT OF ELECTROPHORETIC AND ELEC-TROCHEMICAL WATER PURIFICATION

TRUCHEMICAL WATER PURIFICATION SYSTEMS, Texas A and M Univ., College Station. W. M. Lyle. Available from University Microfilms, Ann Ar-bor, Michigan, Order No. 71-17, 816. Ph. D. Dis-sertation, 1970. 127 p.

Descriptors: "Suspension, "Electrophoresis, "Electrochemistry, "Water purification, Clay, Al-gae, Bacteria, Waste water treatment, Water treat-ment, Model studies. ment, Model studies.
Identifiers: *Parallel plate model.

Electrophoretic and electrochemical systems appeared to be useful in the removal of electrically charged suspended pollutants such as clay, algae, and bacteria. Design concepts of a parallel plate model (entirely for electrophoretic removal) and porous filler and electrode grid models (incorporating both electrophoretic and electrochemical removal) were tested as laboratory models. The parallel plate model achieved successful water carrification only when the influent water had a very low electrical conductivity. Electrochemical verse purification and only overcame this mobilem very low electrical conductivity. Electrochemical water purification not only overcame this problem but was also successful both economically and operationally. An example design of a small semiautomated electrochemical water system which incorporated electrochemical flocculation, settling and disinfection operations is presented. (Albert-Texas) W73-01362 W73-01362

MANAGEMENT AND CONTROL OF COM-BINED SEWER OVERFLOWS, Environmental Protection Agency, Edison, N.J. Storm and Combined Sewer Technology Branch. R. Field, and E. J. Struzeski, Jr. Journal Water Pollution Control Federation, Vol 44, No 7, July 1972. p 1393-1415, 14 fig, 2 tab, 133 ref.

Descriptors: *Combined sewers, *Waste water, *Storm sewers, *Waste water, storm ru-noff, Pollution abatement, Storm flow, Water pol-lution control. lution control.

Identifiers: *Sewer overflows, Storm water

This overview of combined sewer overflow problems details or refers to traditional and adproblems details or refers to traditional and advanced strategies with brief performance and cost comparisons of each. The construction of separate sewer and storm drainage systems ignores the pollution potential of the storm runoff and the high cost of new lines. Recent legislation has provided funds for the research and demonstration of alternatives. Electronic monitoring permits the control of localized peak flows by automatic rerouting to low flow areas. Television cameras detect infiltration from 'clean' sources. Physical-chemical treatment operations have produced control of peak loads when the non-steady state problems are foreseen in the design. This non-steady state aspect has led to the development of new flow control devices as well as a storm water management model which has produced successful designs at six sites throughout the country. Future problems include developing more efficient operating techniques for old, new and proposed systems, as well as updating the storm water management model. (Anderson-Texas) managemen W73-01363

LISTEN. PHOSPHATE REMOVAL ISN'T THE ANSWER, Kappe Associates, Inc., Rockville, Md. For primary bibliographic entry see Field 05G. W73-01364

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REMOVAL FROM VEGETABLE COLOR REMOVAL FROM VEGETABLE TANNING SOLUTION, Vanderbilt Univ., Nashville, Tenn. Dept. of Sanitary and Water Resources Engineering. H. D. Tomlinson.
Available from University Microfilms, Ann Arbor, Michigan, Xerox \$10.60, microfilm \$4.00, Order No. 70-16,439. Ph. D. Dissertation, 1970. 235

Descriptors: *Color, *Tannery effluents, *Waste water treatment, *Hydrogen ion concentration, *Polyelectrolytes, Sedimentation, Sludge, Suspended solids, Industrial wastes.

Suspended solids, Industrial wastes.

Research was done to develop a technique that could be used to remove the color from vegetable tanning solutions in the treatment of tannery waste waters. The sequence of steps involved in the treatment method for color would be as follows: (1) separation of the used vegetable tanning liquor, (2) reduction of the pH of the solution below 3.0 by adding sulfuric acid, (3) maintenance of pH below 3.0, concurrently with the addition of a predetermined dosage of a preselected cationic organic polyelectrolyte, (4) slow mixing to allow sufficient contact time for minimum color removal, (5) approximately 30 minutes of sedimentation, (6) decantation of treated supernatant at a regulated rate to the remainder of the waste flow to allow further treatment if necessary, (7) removal of the sludge for more dewatering, if needed, and disposal. Concurrent with a 90% color removal significant reductions were noticed in suspended solids (85% to 90%) and the COD (50% to 60%). (Albert-Texas) W73-01366

PARAMETERS INFLUENCING PHOSPHORUS ELIMINATION BY ALGAE, Stuttgart Univ. (West Germany). Inst. for Sanitary

K-H. Hunken, and I. D. Sekoulov. ater Research, Vol 6, p 1087-1096, 1972. 11 fig, 7

Descriptors: *Phosphorus, *Algae, *Waste water treatment, Hydrogen ion concentration, Cyanophyta. Identifiers: *Phosphorus elimination.

The process of bioprecipitation of phosphorus uses algal photosynthesis to remove carbonate carbon to alter the pH. To enhance the photosynthetic activity, artificial lights were used, maintaining the pH above 9. Using the accompanying diagram, it is possible to calculate determining technical and economic feasibility. In the batch tests studied, the final pH determined the final P concentration. Mixing by aeration prevented oversaturation with CO2 and started photosynthesis at a pH of 8.3. The submerged illumination made the reaction chamber independent of surface area, allowing more construction freedom. For an algae-free effluent, a filter and a settling basin were satisfactory. (Anderson-Texas) W73-01367

THE PRECIPITATION OF CALCIUM PHOSPHATES FROM FRESH WATERS AND WASTE WATERS, Stanford Univ., Calif. J. F. Ferguson.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Waste Treatment Processes—Group 5D

Available from University Microfilms, Ann Arbor, Michigan, Order No. 70-18,403 Xerox copy \$9.25, microfilm \$4.00. Ph. D. Dissertation, 1970.

Descriptors: "Waste water treatment, Anaerobic digestion, Hydrogen ion concentration, Freshwater, Sediment process, "Chemical precipitation," "Phosphates. Phosphates. Identifiers: Calcium phosphate, Magnesium car-

The precipitation of calcium phosphates as pertains to natural processes in fresh water and phosphate removal associated with waste water treatment was investigated. Using chemical equilibrium calculations and experimental tests on both chemically defined systems and on digestion effluents, the effect of magnesium and carbonate on calcium phosphate precipitation was investigated at conditions resembling those in the anaerobic digestion process which is used for treating organic solids separated during waste water treatment. The results of the precipitation calculations and the experimental studies were in general agreement. With magnesium present the phosphate residual gradually decreased with the low values found at pH above 9: whereas, carbonate precipitation with the calcium phosphate residuals (pH range between 8 and 11). A precipitation model for Ca-Mg-P04-C03-H20-H4+ system is presented and the results are summarized. Other applications to waste water, sediment process and fresh water are discussed. (Albert-Texas)

EFFECTS OF HEAT TREATMENT ON SEWAGE CONTAMINANT REMOVAL THROUGH PRIMARY SEDIMENTATION, Massachusetts Univ., Amherst. Dept. of Civil En-

Master's Thesis, January 1969. 102 p, 16 fig, 19 tab, 60 ref, 4 append.

Descriptors: "Waste water treatment, "Thermal pollution, Biochemical oxygen demand, Chemical oxygen demand, Polyelectrolyte, Flocculants, "Sewage treatment, "Sedimentation. Identifiers: Waste heat treatment.

This study was conducted to determine the feasibility of using excessive heat production in industry as an aid in the treatment of municipal sewage, particularly in the sedimentation process. Analyses of the settled sewage supernatants from both raw and heat-treated sewage indicated that the removal of most contaminants was hindered after heat treatment to 100C. Furthermore, removal of COD was less pronounced than in raw sewage, when polyelectrolyte flocculant aids were added to heat-treated and cooled raw sewage. Not only was there a significant increase in the BOD velocity constant, but, calculations showed that mixtures of raw settled sewage and heat-treated settled sewage exerted a higher ultimate BOD than either constituent when measured separately. (Smith-Texas) This study was conducted to determine the feasi-

OXYGEN RESPONSE OF A HIGH SOLIDS COMPLETELY MIXED ACTIVATED SLUDGE SYSTEM TO TRANSIENT ORGANIC SYSTEM TO TRA LOADINGS, Kansas Univ., Lawrence.

M.G. Chun.

Available from University Microfilms, Ann Arbor, Michigan, Order No. 71-13,287. Ph. D. Dissertation, 1970. 209 p.

Descriptors: *Activated sludge, Domestic sewage, *Waste water treatment, *Aeration, Chemical oxygen demand, Oxygenation.

Identifiers: *Organic loading, Oxygen response,

A laboratory study used as an organic substrate simulated domestic sewage consisting of 40% glucose, 50% glutamic acid, and 10% acetic acid, all by weight as COD. For both three and six hour aeration times, step increases in organic loads were observed, all the studies were performed at 25C in a 10 liter constant temperature fermenter modified to insure complete mixing. Solids were separated by gravity settling in a tube settler designed for a two hour detention time. A Warburg type apparatus modified to measure oxygen uptake under continuous flow conditions observed the oxygen response. The oxygen responses to step increases in organic loadings were characterized by a first-order increase in oxygen uptake rate to an apparent steady-state, although still not terized by a first-order increase in oxygen uptake rate to an apparent steady-state, although still not predictable by steady-state models. A design method based on an energy-synthesis relationship of 1/3 to 2/3 and an endogenous rate of 2 percent, has been proposed which enables the enginer to determine oxygen uptake at any time during a transient. The high solids completely mixed activated sludge system was shown to readily handle large step increases in organic loadings. Effluent quality improved immediately after the transient was initiated. At loading rates greater than 1 lb. COD/day/lb. MLSS the microbial population in the continuous flow studies shifted to a predominantly filamentous growth. (Morparia-Texas) W73-01373

DRINKING WATER - YES. For primary bibliographic entry see Field 05F. W73-01375

AN EVALUATION OF MICROBIAL INDICES IN VARIOUS WASTEWATERS, Kansas Univ., Lawrence. Dept. of Civil Engineer-

D. T. Schwegler. Master's Thesis, August 1970. 76 p, 43 tab, 43 ref,

Descriptors: *Coliforms, *Streptococcus, *Viruses, Domestic wastes, Waste water treatment, Statistical methods. Identifiers: *Fecal coliforms, *Fecal streptococcus, Cattle feedlot waste, Hog farm wastes.

Domestic sewage data, cattle feedlot data and hog farm data were collected to determine: (1) the ef-fectiveness of the coliform test, presently used to measure the bacteriological quality of water, when compared with other bacterial indicators, specificompared with other bacterial indicators, specifi-cally fecal streptococci and fecal coliform organ-isms in the three types of wastes, and (2) the ex-istence of a relationship between viral contamina-tion and bacterial contamination. The data in-cluded bacterial and bacterial phage counts. It is indicated by the data that the coliform test need not be the ultimate criteria for measuring the bac-teriological quality of waste water. The data also indicate that there is no relationship between viral (phage) contamination and bacterial contamina-tion. (Smith-Texas)

SEWAGE SLUDGE INCORPORATION IN EX-PERIMENTAL FIELD PLOTS TO EVALUATE HAZARDS AND BENEFITS, AND DEVELOP TECHNIQUES FOR OPTIMIZING BENEFITS AND MINIMIZING HAZARDS (DRAFT EN-VIRONMENTAL STATEMENT). Agricultural Research Service, Washington, D.C. Soil and Water Conservation Research Div.

Available from the National Technical Informa-tion Service as PB-207 544-D, \$3.00 in paper copy, \$0.95 in microfiche. February 25, 1972. 11 p, 1 fig.

Descriptors: "Sewage aludge, "Sewage disposal, "Environmental effects, "Research and development, Sewage, Sewage treatment, Sludge, Wastes, Fertilizers, Water pollution, Water pollution sources, Maryland, Pathogenic fungi, Pathogenic Autoria, Nitrates, Leaching, Odor, Soil conservations, Nitrates, Leaching, Odor, Soil conservations, C

Identifiers: *Environmental Impact Statements, *Prince George County (Md).

Prince George County (Md).

The proposed project, affecting 4 acres on the Agricultural Research Center in Prince George County, Maryland, will incorporate 1200 dry weight tons of digested sewage sludge into the soil in a series of experimental plots designed to determine application rates and incorporation methods for optimizing benefits and minimizing hazards associated with the use of sewage sludge as a soil amendment. Treatment will be initiated if nitrate or pathogens are present in the waters at levels above those acceptable to the Maryland Department of Health. This project will develop guidelines to provide maximum benefit and minimum hazard to the environment from future incorporation of sewage sludge into the soils. The condition of poor soil in the area of the plot will be improved by the project. Adverse effects are a possible entering of nitrates and pathogens into groundwaters below the plots and some odor accompanying the incorporation process. Alternatives are no action, placement of sludge in land fills, or experimentation entirely in the closed systems of laboratories and greenhouses. (Wheeler-Florida) W73-01408

WATER POLLUTION ABATEMENT IN A PETROLEUM REFINERY, Mobil Oil Corp., New York.

T. R. Morrow. U. S. Patent No. 3,671,422, 5 p, 1 fig, 2 tab, 7 ref; Official Gazette of the United States Patent Of-fice, Vol 899, No 3, p 1092, June 20, 1972.

Descriptors: "Patents, Organic compounds, "Oil pollution, Oil industry, "Pollution abatement, "Industrial wastes, "Phenols, Steam, Water quality, Water quality control, "Waste water treatment, Water pollution control, Adsorption.

Identifiers: "Refinery wastes recovery, "Petroleum refinery wastes.

Information is disclosed on the processing of refinery waters to recover phenolic constituents of catalytic cracking by adsorption with light process naphthas passed to catalytic reforming. (Sinha-DEIS) W73.01524

ARRATION APPARATUS, Keene Corp., Aurora, Ill. Water Pollution Control Div. (assignee). R. J. Nogaj. U. S. Patent No 3,669,422, 4 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 899, No 2, p 597-598, June 13, 1972.

Descriptors: "Patents, "Waste water treatment, Equipment, "Aeration, "Biological treatment, Water pollution control, Water pollution control, Water quality control. Identifiers: "Aerators.

A mechanical aerator is provided of the general configuration known in the prior art but which includes an integral impeller and deflector for forcing water into the air at a uniform rate. It has a low center of gravity, soft starting characteristics and provision for water ballast. (Sinha-OEIS) W73-01525

SEWAGE TREATMENT, Nalco Chemical Co., Chicago, Ill. (assignee). R. D. Sawyer, and J. D. Tinsley.

Group 5D—Waste Treatment Processes

U. S. Patent No. 3,673,083, 5 p, 1 fig, 3 tab, 11 ref; Official Gazette of the United States Patent Office, Vol 899, No 4, p 1506, June 27, 1972.

Descriptors: "Waste water treatment, "Patents, Treatment, Separation techniques, "Phosphates, Sodium compounds, Flocculation, Pollution abatement, Water pollution, Water pollution treat-ment, Water pollution control, Water quality con-Identifiers: *Chemical treatment, Sodium alu-

Soluble phosphates are removed from effluent by controlled additions of sodium aluminate and a flocculant introduced at some point after aeration and prior to discharging of effluent to a receiving body of water. (Sinha-OEIS)

AFFARATUS AND METHOD FOR AERATING

WASTE MATERIAL, The Standard Products Co., Cleveland, Ohio. (assignee).
J. S. Reid.

U.S. Patent No 3,673,082, 3 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 899, No 4, p 1506, June 27, 1972.

Descriptors: *Patents, *Aeration, Equipment, *Bacteria, *Aerobic bacteria, Liquid wastes, Or-ganic wastes, *Waste water treatment, Pollution abatement, Water quality control, Water pollution

An electrically driven air pump is provided for bubbling air through liquid and organic wastes. An automatic pump control periodically energizes the pump preventing an over-supply of oxygen. The control circuit includes a temperature responsive control device for operating the appliance at spaced intervals of time. (Sinha-OEIS) W73-01528

QUICK RELEASE MECHANISM FOR SEWAGE LAGOON ARRATION GUNS,
Atara Corp., Montreal (Canada). (assignee).
D. S. Murphy, and R. C. H. Charest.
U. S. Patent No 3,672,647, 3 p., 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 899, No 4, p 1411, June 27, 1972.

Descriptors: "Patents, "Aeration, Lagoons, "Sewage treatment, Equipment, "Waste water treatment, Aerobic treatment, Bacteria, Pollution abatement, Water quality control, Water pollution control, Water pollution.

An anchoring device is provided for an aeration gun which has two trunnions on it so that two men in a boat can release or replace a gun from the surha coult can release to repeate a guin roll the saf-face of the liquid of an aerated sewage lagoon. The anchoring device comprises the provision of two slots to accept the trunnions and two vertical elon-gated guide bars to control the direction of the guin gated gated ones to control the direction of the gard as it is pushed downwardly against the force of its own buoyancy. The elongated guide bars are free to move axially as they are located in sleeves. In the retracted position (raised) they allow the trunnions to enter or leave the slots but in the normal position they are down and prevent the trunnions leaving the slots when the gun is in position. Preferably the slots are concyclic so that the trunnions may be held against the guide bars by applying twist to the gun. (Sinha-OEIS)

SIPHON TYPE SLUDGE REMOVAL SYSTEM FOR A SEWAGE SETTLING TANK, R. F. McGivern.

U. S. Patent No 3,669,271, 4 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 899, No 2, p 559, June 13, 1972.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Equipment, Pollution abatement, Automatic control, *Sludge, Water pollution, water pollution control, Water quality control. Identifiers: *Settling tanks.

A floating siphon sludge removal system is described in which the discharge outlet of the siphon is submerged in the liquid in the sludge or siphon discharge tank. The submerged siphon outlet will move vertically in the liquid in the sludge tank in accordance with the vertical floating movement caused by variations in level of the liquid in the treating or settling tank. (Sinha-OEIS) W73-01531

TREATMENT MICROWAVE SEWAGE

SYSTEM, W. P. Allen. U. S. Patent No 3,670,891, 3 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 899, No 3, p 970, June 20, 1972.

Descriptors: "Patents, Sewage treatment, "Bacteria, "Radiation, "Microwaves, Sterility, Pollution abatement, Equipment, "Waste water treatment, Water quality control, Water pollution control, Water pollution.

A holding tank is described for receiving raw sewage. The sewage is subjected to microwave radiation of such intensity over a pre-determined time interval, bacteria are destroyed not only by the heat but also by oscillatory effects of the radia-tion on the organisms. (Sinha-ORIS) W73-01535

LIQUID WASTE FEED SYSTEM, National Aeronautics and Space Administration, Washington, D.C. (assignee).
J. B. Hall, Jr., Y. Tung, and L. E. Winn.
U. S. Patent No 3,670,890, 4 p., 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 899, No 3, p 970, June 20, 1972.

Descriptors: *Patents, Equipment, *Liquid wastes, *Waste water treatment, Pollution abatement, Water pollution, *Automatic control, Water quality control, Water pollution control, Water pollution treatment.

The feed system consists of a feed circuit and a sensing circuit to control the flow of waste liquids to and from the processing equipment. It is con-trolled by valves which permit the liquid waste to tround by valves which permit the liquid waste to flow from a supply source to the processing equip-ment. The processed water is pumped into an ac-cumulator which actuates the sensing circuit. The sensing circuit actuates valves which provide a new supply of waste liquid, initiating a new cycle. With proper adjustments the system operates with optimum efficiency. (Sinha-OEIS) W73-01536

AEROBIC DIGESTION OF SLUDGE WITH OX-

VGEN, Union Carbide Corp., New York. (assignce). J. R. McWhirter. U. S. Patent No 3,670,887, 9 p, 6 fig, 2 tab, 12 ref; Official Gazette of the United States Patent Of-fice, Vol 899, No 3, p 969, June 20, 1972.

Descriptors: "Patents, "Aerobic treatment, "Oxygen, "Biochemical oxygen demand, "Dissolved oxygen, Activated sludge, "Aeration, "Waste water treatment, Pollution abatement, Water quality control, Water pollution control, Water pollution.

Gas containing at least 60 percent oxygen by volume is introduced and mixed as the aeration gas with the BOD-containing water and recycled studge. One of these fluids is simultaneously and continuously recirculated against the other fluids

in the aeration zone. The contact time in the aeration zone varies and the fluids are provided in sufficient quantity and rate to maintain the dissolved oxygen content above 0.5 ppm. The mixed liquor is separated into purified liquid and activated shudge, and the unconsumed oxygen-containing gas is discharged from the aeration zone. A second gas with oxygen concentration of 0.70 times the first and unreturned activated shudge are introduced into a digestion zone and held for 96 hours. Waste shudge residue and a third gas containing at least 21 percent oxygen are discharged from the digestion zone. (Sinha-OEIS)

PROCESS FOR SEPARATING STEAM-VOLATILE ORGANIC SOLVENTS FROM INDUSTRIAL PROCESS WASTE WATERS,
Dynamit Nobel Aktiengesellschaft, Troisdorf
(West Germany). (assignee).
E. Peder, K. Deselsers, and G. Czehovsky.
U. S. Patent No 3,669,847, 3 p., 1 fig, 7 ref; Official
Gazette of the United States Patent Office, Vol
899, No 2, p 691, June 13, 1972.

Descriptors: "Patents, "Industrial wastes, "Organic wastes, Separation techniques, Equipment, Treatment, Pollution abatement, Water pollution treatment, Water pollution, Water pollution control, Water quality control, "Steam, "Solvents, "Waste water treatment, "Condensation.

This process consists of mixing the process waste water with steam, withdrawing the azcotropic steam mixture and condensing it. A pump conveys the process waste water from a collecting tank into an injector where it is mixed with industrial steam of 4-8 atmospheres gauge. The water flows into a settling and separating tank, where the azcotropic steam mixture separates from the remaining water and enters a condenser. (Sinha-OEIS) W73-01539

SYSTEM FOR MEASURING BOD BY ELEC-

TROLYSIS, Iowa State Univ. Research Foundation, Inc., Ames. (assignee).
J. C. Young.
U. S. Patent No 3,668,102, 5 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 899, No 1, p 257, June 6, 1972.

Descriptors: "Patents, "Biochemical oxygen de-mand, Water pollution, Water pollution treatment, Water pollution control, Pollution abatement, Treatment, "Electrolysis, Waste water treatment. Identifiers: Waste characterization.

Improvements are provided in the electrolysis method of determining the BOD of polluted water. A cap is placed on the electrolysis cell with an upper circular covering flange spaced from the walls of the cell providing an annualar space communicating with the electrolyte to permit venting of hydrogen while minimizing evaporation of the electrolyte. When the level of the electrolyte falls below a predetermined minimum, indicating a low 02 pressure in the vessel, a sensing switch energizes a regulated DC current source to start the electrolysis to replace the 02 consumed. (Sinha-OEIS) OEIS) W73-01541

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WASTE TREATMENT APPARATUS AND CIR-CULATION UNIT THEREFOR, R. L. Fifer.

U. S. Patent No 3,666,242, 3 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 898, No 5, p 1694, May 30, 1972.

Descriptors: "Patents, "Aerobic treatment, "Waste water treatment, Equipment, Pollution abatement, Water pollution, Water pollution treatment, Water pollution control, Bacteria, "Oxygenation, Biochemical oxygen demand.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Waste Treatment Processes—Group 5D

The circulation unit not only draws liquor from the periphery of the aeration chamber in effecting circulation, but also macerates incoming wastes or raw sewage promoting bacterial action. A circulation and oxygenation unit is disposed in the center of the chamber. The unit has a tubular waste inlet cell which maintains an upright position. It has ports in the upper portion to admit both recirculating waste liquid and air into the cell. The bottom end is open permitting flow of the waste liquid into the bottom of the chamber. An impeller is mounted within the cell. (Sinha-OEIS) W73-01548

SEPARATOR FOR LIQUIDS OF DIFFERENT SPECIFIC GRAVITIES, For primary bibliographic entry see Field 05G. W73-01549

APPARATUS FOR MULTI-STAGE TREAT-MENT OF WASTE MATERIAL, Standard Products Co., Cleveland Ohio. (as-

signee).
H. W. Green.
U. S. Patent No 3,666,106, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 898, No 5, p 1660, May 30, 1972.

Descriptors: "Patents, Pollution abatement, Equipment, Waste treatment, "Waste water treatment," "Acrobic treatment, "Anaerobic treatment, "Activated carbon, Water pollution control, Water quality control, Water pollution treatment, "Filtration. Identifiers: Combined treatment.

This waste disposal system consists of three con-nected tanks. After being subjected to anerobic bacterial action in the first tank the waste material pacterial action in the first tank the waste material is transferred to a second tank where it is subjected to aerobic bacterial action. In the third tank, a treating agent such as an ultraviolet lamp or sodium hypochorite may be employed. A filter filled with activated charcoal may also be placed in the third tank. (Sinha-OEIS) W73-01550

APPARATUS AND PROCESS TO TREAT WASTE WATER FOR POLLUTION CONTROL AND INDUSTRIAL REUSE, Pollution Engineering International, Inc., Pollution Engineering Houston, Tex. (assignee).

L. B. Armstrong.
U. S. Patent No. 3,664,951, 15 p. 13 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 898, No 4, p 1354-55, May 23, 1972.

Descriptors: "Patents, "Waste water treatment, "Water reuse, Equipment, "Industrial wastes, Metals, Organic wastes, "Electrolysis, Foaming, Pollution abatement, Resistivity, "Foam separation, Inorganic compounds, Oxygen demand, "Oxrollution abusement, Resistavity, "Foun separa-tion, Inorganic compounds, Oxygen demand, "Ox-idation, Bubbles, Demineralization, Water pollu-tion treatment, Water quality control, "Odor, Hydrogen ion concentration, Color.

This apparatus and process is designed to remove colloidal, oxygen demanding and odor causing organic matter, inorganic matter and other pollutants from waste water. The pH and resistivity of the water are measured and adjusted to predetermined values. The color of the water is measured and organic and inorganic materials are precipitated. Electrolysis is used to coalesce colloidal materials which are removed mechanically. Bacteria, viruses and other organic matter are killed. An oxidizing agent is added to reduce oxygen demand. Demineralization and metal removal may be achieved by foaming. (Sinha-OEIS)

PROCESS FOR SELECTIVE REMOVAL AND RECOVERY OF CHROMATES FROM WATER, Atomic Energy Commission, Washington, D.C. (assignee).

A. J. Saraceno, R. H. Walters, D. B. Jones, and W. E. Wiehle. U. S. Patent No. 3,664,950, 5 p, 2 fig, 3 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 898, No 4, p 1354, May 23, 1972.

Descriptors: "Patents, "Metals, "Chromium, Water treatment, "Waste water treatment, Pollution abatement, Industrial wastes, Separation techniques, Chemical wastes, Water pollution, Water pollution treatment, Water rouse, Recycling.

Identifiers: *Chemical treatment. *Chromate

Chromate ions are removed and recovered from c.momate nons are removed and recovered from feed water by passing the water through a bed of basic anion exchange resin. Then an alkaline solu-tion containing regenerant ions is passed through the bed to recover the chromate ions. (Sinha-OEIS) W73-01558

AERATING SYSTEM, Xodar Corp., Warwick, R.I. (assignee). J. F. Snow, and R. L. Clough, Jr. U. S. Patent No. 3,664,647, 5 p, 8 fig, 10 ref; Offi-cial Gazette of the United States Patent Office, Vol 898, No 4, p 1285, May 23, 1972.

Descriptors: *Patents, *Aeration, Equipment, Waste water treatment, Sewage treatment, Aero-bic treatment, Pollution abatement, Water quality control, Bubbles, Water pollution control, Water pollution, Water pollution treatment.

The apparatus consists of an aerating body that has negative buoyancy and is adapted to trap and be rendered buoyant by injected air which escapes into the water when the body rises in the water. The body comprises a flexible sheet, ballast carried by the frame and a tethering device attached at one end so that it will rise angularly. It rises and falls cyclically according to the rate of air input and air escape agitating the water as it is aerated. (Sinha-OEIS) W73-01559

PROCESS FOR DEIONIZING WATER, Rohm and Haas Co., Philadelphia, Pa. (assignee). A. Miyahara, M. Fujita, I. Yamamoto, and T.

Katamura.
U. S. Patent No 3,661,775, 4 p, 2 fig, 2 tab, 3 ref;
Official Gazette of the United States Patent Office, Vol 898, No 2, p 595, May 9, 1972.

Descriptors: *Patents, *Cation exchange resins, *Anion exchange resins, *Ion exchange, *Resins, Water purification, Water treatment, *Waste water treatment, Water pollution, Water pollution treatment, Water pollution control, Pollution abatement, Silica, *Desalination, Demineraliza-

tion. Identifiers: *Chemical treatment.

Water is treated with a sequence of one or more water is treated with a sequence of the or indicated acidic cation exchange resins followed by weakly basic and then strongly basic anion exchange resins. The effluent from the cation exchange resin bed is divided so that a major part passes through the weakly basic anion exchange resin and then is mixed with the remainder of the cation exchange bed effluent before passing through the strongly basic anion exchange resin bed. (Sinha-OEIS) W73-01563

REFLECTIVE COOLING PONDS, REFLECTIVE COOLING PONDS, Federal Water Quality Administration, Corvallis, Oreg. Pacific Northwest Water Lab. L. D. Winiarski, and K. V. Byram. Available from ASME, 345 E. 47th St. N.Y.C., 10017, for \$2.00. American Society of Mechanical Engineers Publication 70-WA/PWR-4, July 23, 1970. 8 p, 4 fig, 8 ref. Descriptors: *Cooling, *Ponds, *Solar radiation, Radiation, Heated water, Mathematical models, Model studies, Thermal powerplants, Thermal pollution, Temperature, Heat transfer, Waste water treatment tifiers: *Cooling ponds, *Reflective cooling

Treatment of a cooling pond to make it reflect a major portion of the solar heat load is discussed. The treatment would utilize application of granular or film materials to the water. The desired radiation properties for such materials are low absorptivity to solar radiation and high emissivity for long wave radiation. A mathematical model, developed to predict the performance of both treated and natural ponds and verified with a small-scale field test, shows that treatment significantly reduces the evaporation loss. The model also shows that, under certain conditions, a reflection of the statement of the state also shows that, under certain conditions, a reflective pond could cool the water to a lower temperature and covering a smaller area than a natural pond. (Oleszkiewicz-Vanderbilt)

W73-01571

WASHINGTON POST DEBATES ITSELF OVER POLLUTION CONTROL, House, Washington, D.C. For primary bibliographic entry see Field 06E. W73-01583

INDUSTRY ENVIRONMENTALISTS, House, Washington, D.C. For primary bibliographic entry see Field 06E. W73-01586

RESEARCH SUPPLEMENT TO JOURNAL WATER POLLUTION CONTROL FEDERA-Water Pollution Control Federation, Washington, For primary bibliographic entry see Field 05G. W73-01635

CONCENTRATED MINE DRAINAGE DISPOSAL INTO SEWAGE TREATMENT Environmental Research and Applications, Inc., Wilton, Conn.

Copy available from GPO Sup Doc EP1.16:14010 FBZ 09/71, \$0.75; microfiche from NTIS as PB-213 042, 50.95. Environmental Protection Agency. Water Pollution Control Research Series, September 1971, 76 p, 8 fig, 25 tab, 44 ref. EPA Program 14010 FBZ 09/71.

Descriptors: "Acid mine water, "Brines, "Municipal wastes, "Activated sludge, "Phosphates, Sludge digestion, Sewage treatment, Cost analysis, "Waste water treatment.
Identifiers: "Acid brines (Iron).

Studies were undertaken on a small scale to deter-mine the effect artificial iron-rich acid brines had mine the effect artificial iron-rich acid brines had on municipal sewage treatment processes. The brines were devised to simulate concentrates from treatment of acid mine drainage. At very high concentrations, the brines neutralized with time give virtually complete removal of phosphate from primary effluent, activated sludge effluent, or anaerobic sludge digester decantate. The cost of the iron-rich acid brine produced from acid mine drainage by the reverse osmosis membrane treatment is estimated at \$35/1000 gallons of brine or about 73 cents/1000 gallons of prine or about 73 cents/1000 gallons of

SEWAGE TREATMENT AT SEA, Process Co., Inc. M. W. Hooper, and J. R. Piskura.

Group 5D—Waste Treatment Processes

Oceanology International, Vol 7, No 4, p 37-41, April, 1972. 3 fig, 3 tab.

Descriptors: "Ships, "Sewage treatment, "Waste disposal, Water pollution control, "Water Quality Act, Offshore platforms, Biochemical oxygen de-mand, Legislation, Gulf of Mexico, "Waste water tifiers: *USGS Order No 8.

Identifiers: *USGS Order No 8.

Section 13 of the Water Quality Improvement Act of 1970 requires all watercraft operating upon United States navigable waters and waters of the contiguous zone off the United States to install sanitation devices preventing overboard discharge of untreated or inadequately treated sewage. The U.S. Geological Survey Conservation Division, Oulf Coast Region, subsequently ordered all offshore oil platforms and drilling structures in the Gulf of Mexico to treat all sewage (human body wastes) prior to overboard discharge. Overboard discharge standards and EPA effluent standards are summarized. Problems have arisen over whether the sewage treatment system should process just human body wastes or the combined waste water from all sanitary system components. Primary methods of treatment include: screening, sedimentation, coagulation, filtration, flotation, centrifugation, bio-oxidation, chem-oxidation, active carbon, sludge incineration toilet, recirculating toilet, holding tank, evaporation, total vaporation-incineration, and wet combustion. (McEntyre-PAI)

DELTA COD GETS NOD OVER BOD TEST, Oklahoma State Univ., Stillwater. For primary bibliographic entry see Field 05A. W73-01663

THE ECONOMIC VALUE OF WATER QUALI-TY. Metcalf and Eddy, Inc., Palo Alto, Calif. For primary bibliographic entry see Field 05F. W73-01679

RESEARCH ON MINERAL BY-PRODUCTS FROM SALINE WATER, Grace (W.R.) and Co., Clarksville, Md. For primary bibliographic entry see Field 03A. W73-01695

REDUCING THE ENVIRONMENTAL IMPACT OF POPULATION GROWTH BY THE USE OF WASTE HEAT,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05G.
W73-01711

DESIGN OF COOLING TOWERS CIRCULAT-ING BRACKISH WATERS, Marley Co., San Gabriel, Calif. J. G. DeFlon.

J. G. DEFION. In: Industrial Process Design for Water Pollution Control Workshop, Houston, Texas, April 24-25, 1969, American Institute of Chemical Engineers, New York, p 69-73, 1970. 2 tab, 1 fig.

Descriptors: *Cooling, *Cooling towers, *Brackish water, Cooling water, *Thermal pollution, Environmental engineering, Heat balance, Water pollution sources, Water quality, Chemical properties, Corrosion, Waste water treatment. Identifiers: *Cooling tower design, Chemical treatment.

Brackish waters are more corrosive and more difbrackan waters are more corrosive and more un-ficult to handle than sea or fresh waters. Thermal performance of salt water cooling towers is the same or only slightly different than that of fresh water towers. The problems with chemical and biological attacks on wood construction are discussed. Cost and maintenance on cooling towers cieculating brackish water is about 10% more than the cost of standard industrial towers. A set of recommendations for proper construction and operation of the cooling towers is proposed. The use of polyester fiber glass instead of wood in fan stacks is recommended. Also, use of small metal or wood parts in areas not flooded by water or not saturated with water should be avoided, and pH of the recirculating water must be controlled at or near 7.0 to prevent chemical attack. Care should be exercised in chlorinating the water. (Novotny-Vanderbill)

COOLING TOWER BLOWDOWN TREATMENT

Crane Co., King of Prussia, Pa. Cochrane Div. G. E. Glover.

G. E. GOVET.

In: Industrial Process Design for Water Pollution Control Workshop, Houston, Texas, April 24-25, 1969, American Institute of Chemical Engineers, New York, p 74-81, 1970. 5 fig, 1 tab, 21 ref.

Descriptors: *Cooling towers, *Cooling water, *Waste water disposal, Cooling, Chemical properties, Water pollution, Air pollution, Environmental engineering, Temperature, *Thermal pollution, Cost analysis, Waste water treatment. Identifiers: *Cooling tower blowdown.

Identifiers: *Cooling tower blowdown.

The purpose is to outline the methods which can be used to reduce or eliminate treatment of blowdown waste water from a cooling tower. The amount of blowdown is calculated from the content of dissolved solids in the makeup water and the possibility of scale formation due to precipitation of compounds as the solution becomes concentrated by loss of water through evaporation. The control over cost is discussed for different types of cooling systems. Several methods are used for the disposal of all kinds of blowdown waters: (1) discharge to municipal sewer; (2) discharge to disposal well; (3) lagooning; (4) discharge to on-premises waste treatment plant. Cost estimates are discussed. Methods of treating cooling tower blowdown wastes to meet stream pollution standards are more costly. A method is available for calculating directly the effect upon recirculating water composition of airborne suspended solids and dissolved solids and this method should permit the engineer to select a greater operating concentration with less blowdown. (Novotny-Vanderbilt)

APPLICATION OF AIR COOLED HEAT EXCHANGERS, Hudson Products Corp., Houston, Tex. E. C. Smith.

In: Industrial Process Design for Water Pollution Control Workshop, Houston, Texas, April 24-25, 1969, American Institute of Chemical Engineers, New York, p 82-84, 1970. 5 fig.

Descriptors: *Cooling, *Heat exchangers, *Thermal pollution, Heat balance, Heat budget, Air pollution, Cooling water, Cooling towers, Environemntal engineering, Heat transfer, Thermal properties, Waste water treatment. Identifiers: *Air cooled heat exchangers, Heat

During the last 30 years the use of air cooled heat exchangers has advanced to where roughly 50% to 80% of excess heat from chemical and petrochemical plants, and petroleum refineries is being dissipated directly to ambient air. Three basic equations may be used to compare relative heat transfer surface, coolant amounts, and power requirements for the two coolants, air and water. requirements for the two coolants, air and water.
Air has no limits in temperature rise, therefore
medium to high temperature level service will
require less air flow than water at design. The effect of pumping head is in favor of air, in most
cases, by at least a 3/1 factor. A design guide for

the air cooled exchangers is presented and an illutrative example is shown. (Novotny-Vanderbilt) W73-01714

REDUCTION OF BLOWDOWN FROM POWER PLANT COOLING TOWER SYSTEMS, Southern California Edison Co., Los Angeles,

Cant.

P. B. Christiansen, and D. R. Colman.
In: Industrial Process Design for Water Pollution
Control Workshop, Houston, Texas, April 24-25,
1969, American Institute of Chemical Engineers,
New York, p 85-92, 1970. 1 fig, 4 tab.

Descriptors: *Cooling towers, *Chemical proper-ties, *Water pollution, Cooling, Cooling water, *Thermal pollution, Heat balance, Temperature, Waste water disposal, Air pollution, Thermal powerplants, Cost analysis, Waste water treatment. Identifiers: *Blowdown reduction, Heat loss.

Different methods are being used to reduce the quantities of waste water from a cooling operation. In one case, the treatment technique of an existing facility was modified to reduce waste water production. In the other case, new plant design included facilities for the minimization of the requirements for waste water disposal. Both methods would be incorporated in any new plant design or used to modify the operating technique of any presently operating production facility where economically feasible. The studied cases were Etiwanda power station and development of plans for construction at Mohave. Both plants use Colorado River water as a make-up. Chemical treatment and softening of makeup water and conting surfaces to protect against corrosion are discussed. (Novotny-Vanderbilt) W73-01715

THERMAL POLLUTION AND ITS TREAT-MENT - THE IMPLICATIONS OF UN-RESTRICTED ENERGY USAGE WITH SUG-GESTIONS FOR MODERATION OF THE IM-PACT, Battelle Memorial Inst., Richland, Wash. Pacific

Northwest Labs. For primary bibliographic entry see Field 05C. W73-01722

DRY-TYPE HYPERBOLIC COOLING TOWER, California State Univ., Los Angeles. P. Rogers, and L. Heller. Civil Engineering ASCE, p 56-57, October 1972. 4 fig. 2 tab

Descriptors: *Cooling towers, *Cooling, *Thermal powerplants, Air pollution, Water pollution, Cost analysis, Fog, Winds, Structures, *Thermal pollution, Europe, Environmental effects, Cooling water, Economics, Waste water treatment. Identifiers: *Dry-type cooling, *Air cooling, *Hyperbolic cooling towers, Soviet Union.

With major installations in Europe and the USSR, with major installations in Europe and the USSK, the dry-type cooling tower for power plants allows for freedom of plant location while minimizing the environmental effects of power generation. The basic advantages of the dry cooling towers over the wet, are: 1. Complete independence as far as choice of location is concerned, because the plant need not be located near a large source of water. 2. No make-up water requirement. 3. No separation of cooling water and condensate. 4. This means no contamination of the feed-water. 5. The complete contamination of the feed-water. 5. The complete lack of vapor plume and fogging. 6. Because the air moving through them is relatively dry, dry cooling towers may be built of structural steel. 7. No construction shut-down at wintertime since structural steel erection may proceed virtually uninterrupted year around. 8. With the cooling units placed at the perimeter, the empty interior may be utilized for parts or all of the power plant. 9. The tower may

WATER QUALITY MANAGEMENT AND PROTECTION-Field 05

Waste Treatment Processes—Group 5D

act as an antisabotage protection shield for critical installations placed inside the tower. 10. In strongly seismic areas, steel construction may provide better ductility. At comparable cost, drytowers offer ecological advantages. (Oleszkiewicz-Vanderbilt) W73-01725

THE TREATMENT OF COOLING WATERS WITH CHLORINE

WITH CHLORINE, Argonne National Lab., III. J. E. Draley. Argonne National Laboratory Publication No. ANL/ES-12, February 1972. 11 p, 10 ref.

Descriptors: *Cooling water, *Chlorination, Algi-cides, Slime, *Thermal pollution, Cooling, Ther-mal powerplants, Chlorine, Water pollution, Water quality standards, *Disinfection, Water quality, Waste water treatment. Chemical equilibriu

The use of chlorine as a defouling agent in power ne use of chlorine as a defouling agent in power plants requires assurance that aquatic biota will not be harmed. Three requirements are identified: (1) establishment of standards, (2) development of means of predicting the levels of active chlorine species at points of discharge, and (3) monitoring power plant effluents at points of discharge. Various aspects of the problem are considered. (Oleszkiewicz-Vanderbilt)
W73-01726

IN-SEWER FIXED SCREENING OF COMBINED SEWER OVERFLOWS. Envirogenics Co., El Monte, Calif.

Copy available from GPO Sup Doc as EPI.16:11024 FKJ 10/70, \$1.25; microfiche from NTIS as PR-213 118, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, October 1970, 144 p, 21 fig, 11 tab, 2 ref. EPA Program 11024 FKJ 10/70.

Descriptors: *Combined sewers, *Storm runoff, Descriptors: "Combined severs, "Storm runort, 'Solid wastes, "Sewage treatment, "Waste water treatment, Municipal wastes, Sewers, Screens. Identifiers: "Fixed screens, "Combined sewer overflows, Combined sewer treatment.

Field sampling and measuring were conducted in conjunction with laboratory investigations on the characterization of combined sewage and the effects of solids removal on chlorination practices. 60 combined sewage bulk samples and 60 combined sewage screenings samples retained on screens of 0.125-, 0.25-, 0.5-, and 1.0 in. aperture were analyzed and evaluated. Removals of deox-responding materials, oils and greates and bacteria. were analyzed and evaluated. Removals of deoxygenating materials, oils and greases, and bacteria by fixed screens placed in combined sewers were marginal. Reductions in chlorine requirements as a result of prior solids removal by fixed screening appear small. Screens with aperture sizes ranging from 0.0164 to 1.0 in. appear to have very little effect on bacterial concentrations. (Smith-Texas) W73-01774

EVALUATION OF PHYSICAL PLANS-WATER COLLECTION.

J. B. Thring.
Effluent and Water Treatment Journal, Vol 12, No 5, p 247-259, May 1972. 5 fig, 17 tab, 28 ref.

Descriptors: *Waste water treatment, *Waste water disposal, *Sewerage, *Costs, Population, Density, Demand, Planning. Identifiers: *Cost determinants, Layout, House type, Transmission distance, Service, Growth.

The variations of sewerage and drainage costs with population served, transmission distance, density, layout, and house type are examined in order to provide planners with a guide for predict-

ing the economic consequences of alternative sewerage and drainage development decisions. The per capita investment in complete sewerage systems was found to decrease until population size reached 5,000, after which costs gradually insize reached 5,000, after which costs gradually increased again. Transmission costs were found to be inversely related to the distance between the treatment plant and the population served. The examination of house types indicated that the physical design variable with the largest impact on waste service costs is the number of floors. However, the waste service costs for flats appeared to result from characteristics other than height; they were found to be negatively correlated with the number of persons per dwelling. While the study was able to formulate some tentative conclusions, the absence of economic data for different qualiwas age to formulate some tentative conclusions, the absence of economic data for different quali-ties of treatment made it impossible to form any general impressions about the relationship between waste water removal and the cost of water supply. (Settle-Wisconsin) W73-01808

PURIFICATION OF MINE WATER BY FREEZ-

Applied Science Labs., Inc., State College, Pa.

Copy available from GPO Sup Doc, EP1.16:14010DRZ02/71, \$0.70; microfiche from NTIS as PB-213 121, \$0.95. Environmental Protec-tion Agency, Water Pollution Control Research Series, February 1971, 56 p. 6 ftg, 18 tab 33 ref. EPA14010 DRZ 02/71.

Descriptors: *Acid mine water, *Freezing, *Pollution abatement, Iron compounds, *Hardness, Lime, Coal mine wastes, *Waste water treatment,

Identifiers: Bayonet exchanger, Freon expansion, Indirect freezing.

Partial freezing of acid mine water was used to the Partial treezing of acid mine water was used to the extent of 50% conversion to ice. Various metal and acid components in the product water were consistently in the range of 85 to 90% reduction, with some individual components reduced to 98% on occasion. Acid mine water that had been treated occasion. Acid mine water that had been treated with lime was used in similar freezing experiments and observed to have a reduction of metal ions. The pH remained substantially unchanged and the hardness of the water was reduced by nearly 100%. Considerable variations resulted even with efforts toward good control and reproducibility of operation. A firm conclusion as to reduction of sulfate and reduction of certain individual metals was research because of difficulties with analysis. sultate and reduction of certain individual metals was prevented because of difficulties with analytical results. It is suggested that more reliable data will be obtained if tests are run over a longer period of time, on a somewhat larger scale and in the field, so that elimination of irregularities due to collection, transport and storage can take place. (Smith-Texas) W73-01817

GHYGENIC EVALUATION OF POLYMETHACRYLIC CATIONIC FLOCU-LANTS AND THEIR PERMISSIBLE RESIDUAL
CONCENTRATIONS IN DRINKING WATER,
Moscow Medical Inst., (USSR), Moskovskii
Gosudarstvennyi Meditsinskii Institut (I) (USSR).
For primary bibliographic entry see Field 05F.
W73-01818

STREAM POLLUTION CONTROL PROCESS, M. Sheikh.

U.S. Patent No 3,595,787, 3 p, 6 ref; Official Gazette of the United States Patent Office, Vol 888, No 4, p 1290, July 27, 1971.

Descriptors: "Patents, Oil pollution, "Oil wastes, "Industrial wastes, "Phenols, "Chemical wastes, Pollution abatement, Treatment, Water quality control, Rivers, Lakes, Streams, "Waste water treatment, Water pollution control, Water pollu-

Identifiers: *Chemical treatment, Caustic solution. Sodium hydroxide

Industrial wastes containing significant quantities of oils and phenols are treated before being discharged into lakes, rivers, and streams. The wastes are treated with non-sludge producing treatment chemicals selected from the group consisting of inorganic salts and bases to split the soluble oil waste emulsions into an oil phase and a water phase. 200 milliliters of 50% by weight caustic solution (NaOH) are prepared in a caustic solution tank and transferred to sewage tank. The mixture is agitated and then allowed to separate into the oil and water phase. The water containing the reusable treatment chemicals is recycled for use in further separation of the initial waste emulsions. (Sinba-OEIS)

METHOD AND COMPOSITIONS FOR REMOV-ING PHOSPHATES FROM WATER, Eagle-Picher Industries, Inc., Cincinnati, Ohio.

B. D. Bruce, and H. Seiler.
U.S. Patent No 3,595,785, 3 p, 9 ref; Official Gazette of the United States Patent Office, Vol 888, No 4, p 1289, July 27, 1971.

Descriptors: "Patents, "Waste water treatment, Treatment, "Phosphates, Calcium, Zinc, Pollution abatement, Nutrient removal, Water pollution, Water pollution control, Water pollution treat-ment, Water quality control, Ions. Identifiers: "Chemical treatment, Barium, Borosil-

Waste water containing unwanted phosphate is brought into contact with a borosilicate frit con-sisting of a partially soluble glass with the solute being rich in calcium, zinc, or barium ions or mixbeing rich in carcining and the state of these ions for reaction with the phosphates to produce insoluble phosphates. The borosilicates contain from 5 to 25% by weight of borosilicates contain from 1 to 2 calculated as their oxide, in the melted state, and preferably the frit contains all three. The total amount of the contains all three these states 20% by phosphate precipitating oxides is at least 20% by weight of the frit. (Sinha-OEIS) W73-01830

METHOD AND APPARATUS FOR AEROBIC STABILIZATION OF SLUDGE, Passavant-Werke, Michelbach (West Germany). Michelbacherhutte. (assignee) P. Pflanz, J. Muskat, and W. Ohl.

U.S. Patent No 3,595,783, 4 p, 4 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 888, No 4, p 1289, July 27, 1971.

Descriptors: *Patents, Sludge, *Waste water treatment, *Aerobic treatment, Rotors, Equipment, *Aeration, *Sludge treatment, Water quality control, Water treatment, Aerobic conditions.

Aeration and circulation devices are mounted on a traveling bridge and operate independently of each other. The circulating device stirs up sludge while the aerobic device injects gas such as air into the stirred sludge. The circulating device has a scraper blade which moves along the bottom of the tank and a pump which draws sludge from the bottom of the tank and raises it to the upper part of the tank for aeration. The aeration rotor has an inclined baffle plate which in combination with the rotor provides additional circulation of the sludge. (Sinha-OEIS)

W73-01831

FLOATING AERATION ROTOR, Beloit-Passavant Corp., Janesville, Wis. (assignee) U.S. Patent No 3,595,538, 3 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 888, No 4, p 1239, July 27, 1971.

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Descriptors: "Patents, "Waste water treatment, Equipment, "Aeration, "Roiors, Pollution abate-ment, Water quality control, Water pollution con-trol, Water pollution, Water pollution treatment.

A guided aeration rotor floating in a lagoon is provided. The rotor serates and mixes the water. There is at least one pair of bladed rotors, having logitudinal axes and projecting partially into the water. An adjustable baffle is mounted on the frame between the rotors. It extends into the water to reduce the speed of the frame and promote the projection of air beneath the surface. (Sinha-OEIS)
W73-01835

APPARATUS FOR SEWAGE TREATMENT,

J. R. Kaelin.
U. S. Patent No. 3,595, 537, 3 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 888, No 4, p 1238, July 27, 1971.

Descriptors: "Patents, "Sewage treatment, Equipment, "Rotors, "Aeration, "Waste water treatment, Liquid wastes, Water quality control, Water pollution, Water pollution control, Water pollution treatment.

An aeration rotor is suspended from a floating carrier frame. It is mounted on a vertical axis for partial immersion as it travels across the tank. Supporting rods extend in a radial plane outward and downward from the platform. The rods extend with their outer eads through rough spherical floating bodies. The free ends of the supporting rods projecting beyond the floating bodies are guided in vertical guide channels formed on the internal tank wall to hold the carrier frame against rotation but permitting the upward and downward movement of the carrier according to the level of the sewage in the tank. (Sinha-OEIS)

ARRANGEMENT FOR WATER TREATMENT, S. Mackrie, and V. Mackrie. U. S. Patent No. 3,595,396, 5 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 888, No 4, p 1204, July 27, 1971.

Descriptors: *Patents, *Water treatment, Potable water, *Coagulation, *Floculation, *Filtration, Water quality control, Water purification, Separation techniques, *Sludge treatment, *Waste water

Identifiers: Chemical treatment, Homogenizers.

The arrangement consists of a sludge blanket com-partment, a sludge concentrator compartment and a homogenizer and filter compartment. The com-partments are arranged within cylindrical vessels placed horizontally. The bottom part of the sludge blanket compartment is determined by the mantles blanket compartment is determined by the mantles of at least two adjacent cylindrical vessels. Impurities in the water are congulated by chemical agents and the floccular suspension concentrates in the sludge blanket which is drained by overflow. Clarified water passes through a filter before being discharged. (Sinha-OEIS) W73-01837

WASTE WATER TREATMENT SYSTEM, M. A. Messa, and D. Brown. U. S. Patent No. 3,595,393, 4 p, 8 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 888, No 4, p 1203, July 27, 1971.

Descriptors: "Waste water treatment, "Patents, "Coagulation, "Flocculation, Turbidity, Solid wastes, Organic matter, Surfactants, "Detergents, "Colloids, Separation techniques, Equipment, Pollution abatement, Water quality control, Water pollution control, "Water reuse.

An upflow clarifier is partially surrounded by a filter chamber, an adsorption chamber, and a hold-

ing or storage chamber referred to as a clearwell. A coagulant is mixed in dry form with the water to be treated and delivered to the bottom of the clarifier. The coagulant forms a floc blanket in the clarifier and when the floc blanket rises above a predetermined level a device is activated for partially withdrawing the contents of the floc blanket. The clarified water may be reused or discharged into a nearby body of water. (Sinha-OEIS) W73-01839

PROCESS FOR THE SEPARATION OF SOLIDS FROM A LIQUID BY MEANS OF AN ARTIFI-CIAL GRAVITATIONAL FIELD,

U. S. Patent No. 3,594,315, 2 p. 1 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 888, No 3, p 934, July 20, 1971.

Descriptors: "Patents, "Flocculation, "Sedimenta-tion, "Aeration, "Coagulation, Gravity, Separa-tion techniques, Equipment, Pollution abatement, "Waste water treatment, Water treatment, Water waste water water water treatment, water breatment, water purification, Water pollution control, Water pollution treatment, *Centrifugation.

Identifiers: *Gravity separation.

The liquid to be purified is subjected to an artificial gravitational field of the order of 400 g causing sedimentation to take place and periodically discharging the sediments. The overflow of the artificial gravitational field is aerated, the impurities are then flocculated and the discharged liquid is atomized. The liquid is subsequently introduced into a natural gravity field for flocculation and sedimentation of the remaining coagulated solids. (Sinha-OEIS) W73_01841

METHOD OF SEPARATING OIL, WATER AND SOLIDS BY ULTRASONIC TREATMENT, J. R. Bilhartz, and A. G. Nellis, Jr. U. S. Patent No. 3,594,314, 6 p. 1 fig. 5 ref; Official Gazette of the United States Patent Office, Vol 888, No.3, p. 933, July 20, 1971.

Descriptors: *Patents, Oily water, *Oil wastes, Oil pollution, *Emulsions, Liquid wastes, *Waste water treatment, *Ultrasonics, Pollution abatewater treatment, 'Oliazones, rounded autement, Reparation techniques, Equipment, Treatment, Water quality control, Water pollution con-ldentifiers: *Ultrasonic radiation.

Waste water is subjected to ultrasonic treatment at subcavitation power levels and permitted to settle. A clarified oil phase is recovered as an upper phase. A lower phase is removed and subjected to another ultrasonic treatment and is then separated to recover an upper free oil phase and a lower water and solids phase. The water and solids are separated for reuse or disposal. Intermediate emulsion phases may undergo additional ultrasonic treatment for further separation. (Sinha-OEIS) OFIS) W73-01842

LIQUID PURIFICATION SYSTEM WITH ZETA-POTENTIAL CONTROL OF CHEMICAL ADDI-

TIVES, International Waterpure Corp., Fallsington, Pa.

(assignee).
R. C. Carlson.
U. S. Patent No. 3,594,313, 4 p, 2 fig, 4 ref; Office. cial Gazette of the United States Patent Office, Vol 888, No 3, p 933, July 20, 1971.

Descriptors: *Patents, *Zeta-potential, *Floccula-tion, *Congulation, Water treatment, Water purifi-cation, Water quality, Equipment, Treatment, *Waste water treatment, Liquid wastes. Identifiers: *Chemical treatment.

This system is adapted to remove colloids from liquid wastes by flocculation and coagulation. This is achieved by controlling the zeta-potential of the liquid at the initial stages. After a zeta-potential value is determined and obtained by the addition of chemicals, the flow of the liquid is scanned by an automatic control unit which regulates the amount of chemicals to be inserted. (Sinha-OEIS) W73-01843

MULTIPLE RE-USE OF WATER, El Paso Southern Co., Tex. (assignee). W. H. Chapman, and J. F. Eichelmann, Jr. U. S. Patent No. 3,592,743, 4 p, 5 fig, 12 ref; Offi-cial Gazette of the United States Patent Office, Vol 888, No 2, p 554, July 13, 1971.

*Patents, Descriptors: "Patents, "Water reuse, "Demineralization, Water treatment, "Waster water treatment, Saline water, Brackish water, Water quality control, Water supply, Water pollution treatment, Separation techniques, Pollution abatement, "Condensation, "Recycling.

Identifiers: Chemical treatment.

A demineralization system is combined with a system using a relatively non-volatile fluidizing liquid (oil) and which is able to operate on waste waters of high solid content. The latter receives high mineral content effluent from the demineralizer as well as waste waters from the industrial izer as well as waste waters from the industrial and/or domestic sources. The mixture is subjected to dehydration by heat evaporation and condensation providing a condensate water effluent and a slurry. The slurry containing mineral and organic solids suspended in the fluidizing oil undergoes a process whereby solids are separated from the oil and recycling the latter for continued operation. A portion of the condensate water is returned to industrial use and another for domestic use. (Sinha-OEIS) OEIS) W73-01846

WATER TREATMENT SYSTEM, For primary bibliographic entry see Field 05F. W73-01847

SEWAGE TREATMENT PROCESS AND AP-PARATUS, FMC Corp., San Jose, Calif. (assignee).

P.J. Neuspiel.
U. S. Patent No. 3,591,492, 6 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 888, No 1, p 262, July 6, 1971.

Descriptors: "Patents, "Aerobic treatment, Biochemical oxygen demand, Microorganisms, "Aeration, "Waste water treatment, "Sewage treatment, Treatment, Separation techniques, Equipment, Pollution abatement, Water pollution control, Water pollution treatment.

The apparatus consists of an aeration tank, an aerator, a settling tank, a sludge removal device, a holding tank and a conduit for transfer of sludge. holding tank and a conduit for transfer of sludge. The process involves a combination of operations in aeration and settling zones. The aerator mixes the tank contents and incorporates air into the mixed liquor so that microorganisms may remove the BOD. The sludge is returned from the settling zone to the aeration zone where it is mixed with the influent sewage. Clarified effluent is separately discharged. (Sinha-OEIS) W73-01853

METHOD FOR THE TREATMENT OF AQUE-

OUS WASTES, E. G. Smith, and J. W. Hood. U. S. Patent No 3,591,491,4 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 888, No 1, p 262, July 6, 1971.

WATER QUALITY MANAGEMENT AND PROTECTION-Field 05

Ultimate Disposal of Wastes—Group 5E

Descriptors: "Patents, "Biological treatment, Sludge, "Waste water treatment, "Organic wastes, "Ultraviolet radiation, Radiation, "Aerobic treatment, Microorganisms, Pollution abatement, Water quality control, Water pollution control, Liquid wastes, Biodegradation.

A microbial biolysis unit consisting of a source of radiant energy is interjected into the return studge circuit. A controlled portion of the studge so treated is returned to the system. Substantially all of the biodegradable matter is consumed and only a small quantity of studge is removed for final disposal. (Sinha-OEIS)

PORT FACILITY SHIP SEWAGE COLLEC-TION, TRANSPORTATION AND DISPOSAL SYSTEM, Underwater Storage, Inc., Washington, D.C. (assignee). For primar W73-01855 nary bibliographic entry see Field 05G.

EVALUATION OF CONDITIONING AND DE-WATERING SEWAGE SLUDGE BY FREEZING. Milwaukee Sewerage Commission, Wis.

Copy available from GPO Sup Doc as EP1.16:11010 EVE 01/71, 30.70; microfiche from NTIS as PB-213 122, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, January 1971, 67 p, 10 tab, 3 fig, 11 ref. EPA Program 11010EUE01/71.

Descriptors: *Sludge disposal, *Municipal wastes, *Cost analysis, *Waste water treatment, *Dewatering, Cost comparison, Capital costs, Freezing, Operating costs, Flotation. Identifiers: *Sludge conditioning, *Sludge freezing, Sludge dewatering.

The purpose was to obtain data for a direct com-parison between the freeze conditioning and de-watering technique and the conditioning and de-watering methods presently employed at Milwau-kee. The laboratory investigation phase resulted in a freeze-conditioning system consisting of the fol-lowing process elements: (1) Flotation thickening lowing process elements: (1) Flotation thickening prior to freezing, (2) Freezing in thin sheets, (3) Thawing of the frozen product, and (4) Dewatering of the thawed sludge. The objective of the engineering design phase was the development of a freeze-conditioning system to handle three tons dry solids per day of activated sludge. Although the freeze conditioning concept, from a technical standpoint, has definite merit as a sludge conditioning process, the equipment capital costs, operating costs, and space requirements are appreciably greater for the freeze conditioning process than for the present chemical conditioning method. It is recommended that the objectives redirected to the investigation of alternate sludge conditioning and sludge dewatering means. (Smith-Texas)

FORMER CAMP PARKS SEWAGE DISPOSAL PLANT, PARCEL A-2, PLEASANTON, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT). General Services Administration, Washington, D.C.

Available from the National Technical Informa-tion Service as PB-208 184-D, \$3.00 in paper copy, \$0.95 in microfiche. April 6, 1972. 11 p, 1 map.

Descriptors: *California, *Bnvironmental efforts, *Sewage lagoons, *Oxidation lagoons, *Sewage treatment, Sewage disposal, Sanitary engineering, Waste disposal, Water quality control, Sewage, Watershed management, Waste water (Pollution),

Waste water disposal, Waste water treatment, Water pollution, Air pollution, Odor, Reclaimed water.
Identifiers: *Environmental Impact Statements,

*Pleasanton (Calif.).

The project action proposes to utilize 139 acres of federal government surplus property fronting U.S. Highway 50 in Pleasanton, California. Project action would include construction of a reclamation facility for the treatment of waste water generated from sewage treatment and disposal plants in the area. The proposed action would use the sewage oxidation ponds presently located on the property as holding basins to avoid adverse environmental effects in the downstream reaches of Alameda Creek, 28 miles east of Oakland, California. This interim measure is consistent with the water quality management plan being prepared for the Alameda Creek watershed. Adverse environmental effects of the proposed project are: (1) construction noise, dust, and traffic; (2) odor emissions; (3) insect nuisance; (4) leakage leading to ground water contamination; and (5) salinity increases resulting from evaporation and subsequent discharge to the Alamo Canal. Alternatives considered were reduction of sewage flow from usscharge to the Atamo Canal. Alternatives con-sidered were reduction of sewage flow from homes and industry, and disposal to other areas of effluent above the 2.5 million gallon per day capacity of the local sewage district. (Beardsley-Florida) W73-01943

POLLUTION PRINCIPLES/WATER POLLU-TION AND SEWAGE DISPOSAL, B. J. Riordan. In: Environmental Quality and New York City. First National City Bank, New York, April 1972. p

Descriptors: "New York, "Federal Water Pollution Control Act, "Environmental effects, "Social aspects, Water quality, Water pollution, Water pollution control, Water pollution treatment, Water pollution abatement, Sewage disposal, Industrial wastes, Municipal wastes, Sewage treatment, Waste disposal, Water pollution sources, Economic impact, Costs, Social impact, Urban areas, Treatment facilities, Urban hydrology, Watersheds (Basins).

The specific problems of sewage disposal and treatment in and around New York City are evaluated. The human and industrial waste which is produced by New York, the largest population concentration of comparable geographic size served by the same drainage system in the United States, has made sewage treatment and handling a major problem for New York. The effectiveness of the Federal Water Pollution Control Act of 1956 and the 1971 amendments to that act in eliminating of the Federal Water Pollution Control Act of 1956 and the 1971 amendments to that act in eliminating pollutant discharges from the navigable waters around New York City is discussed. Suggestions for future plans for dealing with waste disposal take into consideration the effects upon wildlife, recreation, and the economy of the New York area as an industrial and shipping center. Ending divergence between social and private costs is the key to pollution control. Only by forcing the polluters rather than the private citizen to bear the costs imposed by pollution can the problem be solved. Several methods of internalizing the social cost of pollution are proposed. The principal advantage of observation meanings or internalizing the social cost of pollution are proposed. The principal advantage of cleaning up the waters around New York City would be increased recreational opportunity. (Chavis-Florida)

W73-01945

NAVAL AIR STATION, LEMOORE, CALIFOR-NIA; SEWAGE DISPOSAL FACILITY (LAND ACQUISITION) (FINAL ENVIRONMENTAL IM-PACT STATEMENT). Department of the Navy, Washington, D.C.

Available from the National Technical Informa-tion Service as PB-199 018-F, 53.00 in paper copy, 50.95 in microfiche. February 1972. 41 p, 2 fig, 1 map, 4 tab, 1 append.

Descriptors: "Environmental effects, "California, "Sewage treatment, "Water quality control, "Land use, Inorganic compounds, Sewage disposal, Sewage Water pollution, Wastes, Waste disposal, Water quality, Chemical wastes, Land management, Land tenure, Sanitary engineering, Sewage lagoons, Water pollution control. Identifiers: "Environmental Impact Statements, "Lancore (Califo.") *Lemoore (Calif).

This project consists of the acquisition of approximately 440 acres near the Naval Air Station, Lemoore, California. Sewage treatment and evaporation ponds for sewage and surface water runoff from the Naval Air Station will be constructed on this land in order to eliminate concentrations of inorganic chemicals harmful to vegetation. The area is a flat, semi-arid plain, the economy of which is based entirely on agriculture. Environmental impacts and educant autorometers. my of which is based entirely on agriculture. En-vironmental impacts and adverse environmental effects include: flooding of 400 acres destroying some wildlife habitats; evaporation ponds provid-ing an aquatic habitat attractive to waterfowi; climination of the present use of the land for mar-ginal grazing and growing; termination of some oil and gas leases; and a tax loss of \$1,200 per year due to the land acquisition. Four alternatives were considered for reduction of inorganic chemicals. These included: distillation, electrodialysis, ion exchange and evaporation ponds. The long term effect to improve the water quality outweighs the short term use of the environmental area for mar-ginal farming. Irretrievable commitments of natu-ral resources include the commitment of the land. The proposed evaporation ponds could be drained The proposed evaporation ponds could be drained in the future but the lands would be unsuitable for farming, (Crow-Florida) W73-01946

5E. Ultimate Disposal of Wastes

MAGNETIC RECOVERY OF FERROUS METALS FROM REFUSE, Mecal (Australian) Ltd., Melbourne. T. G. Hawker. Australian Chemical Processing and Engineering, Vol 25, No 7, p 20-21, July 1972, 2 fig.

Descriptors: *Waste treatment, *Incineration, *Metals, Waste disposal, Recycling.
Identifiers: *Ferrous metals, Clinker, *Magnetic

Recovery of ferrous metals from raw refuse can be impaired by the pressence of large or heavy objects such as mattresses. Cross-belt overband extractors produce relatively dross-free cans, but paper contaminants are better removed by in-line overbands. The operating height, burden, and minimum can size to be extracted affect the magnet size needed. Incinerated refuse requires a large operating gap, light burden and high conveyor belt speed, but efficiency is reduced by the clinker formed on the can walls, increasing the weight by as much as 150%. Palverizing before incineration gives a quicker burnout and allows metal separation before incineration. Marketing scrap metal determines that overband extractors are the best solution, but if a market for metal-free clinker developes, magnetic drums or pulleys could be attractive. (Anderson-Texas) Recovery of ferrous metals from raw refuse can

SEWAGE SLUDGE INCORPORATION IN EX-PERIMENTAL FIELD PLOTS TO EVALUATE HAZARDS AND BENEFITS, AND DEVELOP TECHNIQUES FOR OPTIMIZING BENEFITS

Group 5E-Ultimate Disposal of Wastes

AND MINIMIZING HAZARDS (DRAFT EN-VIRONMENTAL STATEMENT).
Agricultural Research Service, Washington, D.C.
Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 05D.
W73-01408

HARBOR DREDGING PRESENTS ANOTHER WASTE DISPOSAL PROBLEM.

mes, Vol 15, No 4, p 11-13, November,

Descriptors: Rivers, *Bays, *Harbors, *Dredging, *Waste disposal, *Waste dumps, Oceans, *Marine animals, Fisheries, Lobsters, Clams, Fish, *Rhode

Identifiers: *Providence (R.I.,), *Providence River, *Narragansett Bay, Rhode Island Sound, Ouahogs.

Quahogs.

Dredged spoil from the dredging of harbors and rivers must be disposed of economically and with minimum damage to the environment. Dredging wastes from Providence Harbor, Rhode Island, which were deposited in the Rhode Island Sound outside Narragansett Bay from December 1970. September 1970, were studied to determine the resulting physical changes in the dumping area and effects on marine life. Two bathymetric surveys with sonic depth recorders, and diver observations were utilized. Small currents and tides appeared incapable of depositing any of the spoil material on or near the area beaches. Direct effects on marine life were limited, with the major fisheries of finish, lobster and quahogs being disturbed only slightly. Concluding recommendations for ocean dumping were: unpolluted or coarse materials should cover polluted or silty materials; bottom current information should be obtained before dumping fine-grained sediments; permanent records of dumping sites and their surrounding areas should be maintained; and benthic animal colonization should be monitored until permanent communities are established. (McEntyre-PAI)

TRACKING WASTE BY RADIOACTIVITY, Wimpey (George) and Co., Ltd., London (En-gland). For primary bibliographic entry see Field 05B. W73-01647

OCEAN DUMPING: WHAT AND WHERE, IF

AT ALL, American Society of Civil Engineers, New York. American Society of Civil Engineers, New York.

E. E. Dallaire.

Civil Engineering, Vol 41, No 11, p 58-62,

November, 1971. 1 tab.

Descriptors: *Sludge disposal, *Water pollution control, *Ecology, *Waste dumps, *Estuaries, Dredging, Oceans, Legislation, Pennsylvania. Identifiers: *Ocean dumping, *Philadelphia.

Ecological, operational and economical aspects of ocean dumping as means of waste disposal are examined. An estimated 70-90 million tons per year of man-made wastes are being barge-dumped into the oceans because coastal city land disposal sites are being exhausted and ocean dumping provides he least costly means of sludge disposal. About 120 offshore disposal sites are presently in use, poorly marked and chosen without ecology in mind. While the general public wants total ban of ocean dumping, the Nixon Administration's stand is more moderate. The proposed Marine Protection Act of 1971 stops solid wastes and undigested sewage sludge dumping, phases out digested sludge dumping and dredge spoils, and regulates unpolluted dredge spoils and wastes dumping in constal estuarine areas. For intelligent waste management a sweeping ban on all ocean dumping ahould be avoided. Compatible wastes for ocean

dumping are: unpolluted dredge spoil; construc-tion and demolition debris, some mining wastes, and oil-well drilling cuts; organic municipal refuses and clean residues from treatment plants; various agricultural and cannery wastes; and sewage treatment plant effluents. The virtual zero impact of Philadelphia's ocean sludge dumping is described. Alternatives to ocean disposal, and needed research and development are discussed. (McEntyre-PAI) W73-01648

THE ECONOMICS OF DISPOSAL POLLUTION AND RECYCLING, For primary bibliographic entry see Field 05G. W73-01795

EVALUATION OF CONDITIONING AND DE-WATERING SEWAGE SLUDGE BY FREEZING.
Milwaukee Sewerage Commission, Wis.
For primary bibliographic entry see Field 05D.
W73-01839

POLLUTION PRINCIPLES/WATER POLLU-TION AND SEWAGE DISPOSAL, For primary bibliographic entry see Field 05D. W73-01945

5F. Water Treatment and **Quality Alteration**

PARTICLE SEDIMENT IN CURVED PATH FLOW, Clemson Univ., S.C. Dept. of Engineering For primary bibliographic entry see Field 02J. W73-01306

PARTICLE SETTLEMENT IN SPIRAL VORTEX

FLOW, Clemson Univ., S.C. Dept. of Engineering. P. B. Zielinski, and L-Y. Chen. Completion Report, (1972), 21 p, 7 fig, 1 tab, 6 ref.

Descriptors: "Vortices, "Rotational flow, "Sedimentation, "Forecasting, "Water treatment, Mathematical studies, Equations, Analytical techniques, Data collections, Correlation analysis, Particle size, Settling basins.
Identifiers: Vortex grit chamber, Predicting settle-

A mathematical expression is presented which can be used to predict the location of particle settlement in a vortex grit chamber, and the equation is compared with experimental results. The grit tested was sand, having a specific gravity of 2.65, and ranged in particle size from number 16 sieve (ASTM) to number 100 sieve, which covers the range of sizes of heavy grit desired to be removed in grit chambers. Graphs show the correlation between the measured position of settlement and the predicted position. The flow rates were varied from approximately 0.1 cfs to 1.3 cfs, while the depth of flow varied from 0.3 feet to 2.1 feet for a varied arrangement of the number of inner boundary vanes as well as the angle of inclination of the vanes. (Woodard-USGS)

AN INVESTIGATION INTO THE DEVELOP-MENT OF ELECTROPHORETIC AND ELEC-TROCHEMICAL WATER PURIFICATION

SYSTEMS, Texas A and M Univ., College Station. For primary bibliographic entry see Field 05D. W73-01362

DRINKING WATER - YES.

Southern Pulp and Paper Manufacturer, Vol 33, No 7, p 22-23, July 10, 1970.

Descriptors: Waste water treatment, *Effluent, Water reuse, Texas, Treatment facilities, Industrial wastes, *Potable water. Identifiers: *Neches River (Tex).

A humoristic account is given of an event that dramatized the fact that the effluent from treatment facilities of a pulp and paper mill in Eastern Texas was non-polluting. After having been challenged by a local person, Mr. Crawford, the Vice-President of Eastex Incorporated in Evadale, Texas, proved his claims by drinking the water from the Neches River, where the effluent was being discharged. The effluent from \$4,000,000 worth of treatment facilities-clarifiers, aerators, and settling ponds plus a 16 mile long canal, although dark, is clean enough to drink. (Morparia-Texas) W73-01375

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LESS RHETORIC NEEDED,

Bureau of Domestic Commerce, Washington, D.C. Office of Business Research and Analysis. For primary bibliographic entry see Field 06C. W73-01588

POLLUTION FACILITIES CONTINUE TO PRO-VIDE SUBSTANTIAL TAX BENEFITS, Hamel, Park, McCabe and Saunders, Washington, D.C.; and Hamel, Park, McCabe and Saunders, Chicago. III Chicago, Ill.
For primary bibliographic entry see Field 06E.
W73-01590

THE NECESSITY OF CONTROLLING BACTERIAL POPULATIONS IN POTABLE WATERS: COMMUNITY WATER SUPPLY, Environmental Protection Agency, Cincinnati, Ohio. Water Supply Research Lab.
E. E. Geldreich, H. D. Nash, D. J. Reasoner, and R. H. Taylor. Journal of the American Water Works Association, Vol 64, No 9, p 596-602, September 1972. 6 tab, 56 ref.

Descriptors: Water pollution control, *Bacteria, *Potable water, *Water treatment, Water supply, Water quality control, *Chlorination, Turbidity, Monitoring, Public health, Taste, Water purification, Odor, Pollutant identification, Enteric bacteria, Pathogenic bacteria, E. coli, Coliforms, Pseudomonas, Clostridium, Salmonella, Shigella, Mycobacterium.

Identifiers: Achromobacter, Proteins, Arthrobacter, Gallionalla Lentathris, Schieller, Schieller, Statistical Proteins, P

Identifiers: Achromobacter, Proteins, Arthrobacter, Gallionella, Leptothrix, Spirillum, Serratia, Corynebacterium, Bacillus, Flavobac-terium, Plate counts.

Bacteria carried past the disinfection barriers in preparation of potable water can be monitored by continuous turbidometric measurement and standard plate-count techniques. Once in the distribution system, supression must be accomplished; the critical level of such suppression occurs when the general bacterial population exceeds 1,000/ml. This population can be controlled to below a 500/ml level by maintenance of a residual chloride level of approximately 0.1-0.3 mg/l. (Mackan-Battelle) telle) W73-01667

EFFECT OF BUFFER INTENSITY AND OR-GANIC MATTER ON THE OXYGENATION OF FERROUS IRON, Quebec City Water Board (Quebec). Industrial

Waste Div. For primary bibliographic entry see Field 05B. W73-01668 SPECIAL LAKE WATER TREATMENT go Dept. of Water and Sewers, Ill. Bureau of

Water.
J. C. Vaughn.
Journal of the American Water Works Associa-tion, Vol 64, No 9, p 585-589, September 1972. 10 fig, 2 ref.

Descriptors: "Water treatment, Water pollution effects, "Treatment facilities, "Influent streams, "Great Lakes, Aquatic algae, Ice, Fish, Microorganisms, Odor, Taste, Plankton, Chemicals, Pacaols, Chlorine, Oxidation, Adsorption, Activated carbon, Sludge treatment, Diatoms, Coagulation, Calcium carbonate, Hydrogen ion concentration, Filtration, Plankton nets, Nuisance algae, Cladophora.

Identifiers: "Interference, Alewives, Dichotomosinhon Ergelicia, Tabelleria, Tabell

Identifiers: "Interference, Alew Dichotomosiphon, Fragilaria, Tabel Asterionella, Synedra, Dinobryon, Melosira.

Asterionetta, Synedra, Dinobryon, Metosara.

Water treatment plants depending on surface water for filtration treatment are liable to many intake delivery problems. Icing up of intakes can be avoided by design techniques, backflushing, temperature control, and cleaning by blasting. Blockage of intakes by fish (alewives) has been remedied by protective nets and screens. Algal collections on screens or nets require positive pressure for removal (Dichotomosiphon, Cladophora) or installation of revolving screens and pulverizing equipment. Plankton (Fragillaria, Tabellaria, Asterionella, and Synedra) can best be gotton rid of by a good surface-wash system so that broken-up mats can be removed from filters by backwashing. Problems with tastes and odors can result from microorganisms (Dinobryon) or chemicals. Treatment usually involves oxidation by excess chlorine treatment and/or adsorption onto activated carbon. Microstrainers and sludge blanket devices required normal maintenance and onto activated carbon. Microstrainers and sludge blanket devices required normal maintenance and some supplementation. The most difficult and expensive problem involves wintertime diatoms (Melosira). A side issue of their proliferation is development of colloidal turbidity; doubling coagulant dosage appears somewhat remedial. Calcium carbonate and pH changes appear related to Melosira blooms. (Mackan-Battelle) W73-01669

THE ECONOMIC VALUE OF WATER QUALI-TY. Metcalf and Eddy, Inc., Palo Alto, Calif.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price \$2.00. Office of Saline Water Research and Development Progress Report No 779, January 1972. 223 p. 32 fig, 23 tab, 22 ref, 5 append. Contract 14-01-0001-545.

Descriptors: *Cost-benefit analysis, Economics, *Water utilization, *Evaluation, Methodology, Desalination, *Costs, *Water quality, *Water treatment, *Waste water treatment.

A preliminary investigation of the economic value of water quality is described. Costs incurred by domestic, industrial and commercial water users were determined and the data obtained were used to establish user costs for water of a wide range of qualities and to provide a basis for predicting how these costs would change if the mineral content were altered and/or reduced by treatment and/or salinity reduction. A methodology for estimating the benefits of improving water quality by salinity reduction is thus provided. (OSW abstract) W73-01679

SOCIOECONOMICS OF MULTIPLE USES, Stone (Ralph) and Co., Inc., Los Angeles, Calif For primary bibliographic entry see Field 06B. W73-01807 THE EFFECT OF ACTIVE CHLORINE IN-GESTED IN DRINKING WATER, Akademiya Meditsinskikh Nauk SSSR. M. A. Gubar, T. P. Bogdanova, A. T. Voronov, and T. P. Butuchenkova. Hygiene and Sanitation, Vol 35, No 8, p 188-193, Aug. 1970. 2 fig, 1 tab, 9 ref.

Descriptors: *Water treatment, *Public health, *Chlorine, Organoleptic properties, *Potable water, Chlorination, Water supply.

The published data on the effect on the body of chlorinated water are controlletory. The capacity of the oral nucous membrane and that of the gastrie juice of man to adsorb active chlorine from water and the resistance of the mucous membrane to its irritating action were investigated. The irritating effect of active chlorine on the upper sections of the digestive tract in case of a long-term use of chlorinated water was studied in a test carried out on ablino rats. Residual chlorine concentrations in water within the level 2.5 mg/l were practically innocuous. (Bean-AWWARF) W73-01816 The published data on the effect on the body of

GHYGENIC EVALUATION POLYMETHACRYLIC CATIONIC FLOCUL-LANTS AND THEIR PERMISSIBLE RESDUAL CONCENTRATIONS IN DRINKING WATER, Moscow Medical Inst., (USSR). Moskovakii Gossudarstvennyi Meditsinskii Institut (I) (USSR). M. B. Trakhtman. Hygiene and Sanitation, Vol 34, No 9, p 305-310, Sept. 1969. 2 fig, 1 tab, 2 ref.

Descriptors: "Water treatment, "Public health, "Polymers, "Polystyrene, "Coagulation, "Flocculation, Teste, Odor, Toxicity, Hydrogen ion concentration, Bacteria, Potable water, Waste water

Identifiers: Clarification (Water), Decoloration.

Identifiers: Clarification (Water), Decoloration.

The flocculants VA-102 and VA-212, used without any additional reagents, were as effective as aluminum sulfate for the clarification and decoloration of water, and had a higher capacity for the aborption of bacteria and phages. In contrast to the mineral coagulant, the flocculants did not affect the pH of the water; their effective doses were amaller than that of the coagulant. The flocculants affected the organoleptic properties of water, their effect on taste being stronger than that on odor. The gustatory threshold of both flocculants was 14 mg/l. Standards for the residual amounts of these flocculants in drinking water should be based on their toxic effects. The dose found to have no toxic effects in a long-term toxicological experiment corresponds to a concentration of 2 mg/l; this concentration is recommended as the maximum permissible concentration. Although the processed water may contain residual amounts of the flocculants, it does not contain their degradation products. The colorimetric method is sufficiently sensitive for the monitoring by sanitary laboratories of the residual amounts of VA-12 and VA-212 in drinking water. (Bean-AWWARF)

ON THE DEFINITION OF INDICATOR COLI BACTERIA IN THE DRAFT PROJECT OF THE NEW GOVERNMENT STANDARD (GOST) FOR DRINKING WATER (INTENDED TO SUPER-SEDE GOVERNMENT STANDARD GOST 2874-54)

SEDE GOVERNMENT STANDARD GOST 2-54), Nauchno-Issledovatelskii Institut Gigit Moscow (USSR). For primary bibliographic entry see Field 05G. W73-01819

PERMISSIBLE RESIDUAL AMOUNTS OF NEW CATION FLOCCULANTS IN DRINKING

kovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).

B. R. Vitvitakaya. Hygiene and Sanitation, Vol 34, No 5, p 169-173, May 1969. 2 fig, 5 ref.

Descriptors: "Water treatment, "Public health, "Polymers, Polyelectrolytes, "Coagulation, "Floc-culation, Sedimentation, "Potable water, Taste, "Organoleptic properties.

*Organoleptic properties.

The threshold concentrations of the flocculants investigated, in terms of the organoleptic properties of water (taste), were 5 mg/l in the case of polystyrene flocculants and 3 mg/l in the case of polystyrene flocculants and 3 mg/l in the case of polysinyl toluene flocculants. VA-2 was less toxic than VA-3, and VA-2T was less toxic than VA-3T. All the cation flocculants investigated possessed weak cumulative properties. The prolonged administration of doses of 1 mg/kg caused changes in the inver's carbohydrate and proteinogenic functions, and an active reaction on the part of the reticular tissue of the spleen and liver. Similar, though transient, changes were caused by doses of 0.1 mg/kg. A dose of 0.02 mg/kg had no effects. Standards for the flocculants were caused by doses of 0.1 mg/kg. A dose of 0.02 mg/kg had no effects. Standards for the flocculants for their residual amounts in drinking water. Experimental investigations and field tests thus permit the recommendation that the flocculant VA-2 be extensively used for water processing; its residual concentration in drinking water should not exceed 0.5 mg/l. (Bean-AW-WARF) water WARF) W73-01820

THE LONG TERM EFFECT OF NATURAL URANIUM ON THYROID FUNCTION, Nauchno-Issiedovatelskii Institut Gigieny, Moscow (USSR).
For primary bibliographic entry see Field 05C. For primar W73-01821

THE NEED FOR LIMITING THE SILVER CON-TENT OF DRINKING WATER, Ministerstvo Zdravookhraneaiya SSSR, Moscow. For primary bibliographic entry see Field 05C. W73-01822

THE PART PLAYED BY WATER IN THE RRANSMISSION OF LEPTOSPIROSIS IN THE NORTH OSSETIAN ASSR, North Ossetian Republican Sanitary-Epidemiological Center, Ordzhonikidze (USSR). For primary bibliographic entry see Field 05C. W73-01823

OZONATION OF WATER CONTAINING DRUG-RESISTANT FORMS OF SHIGELIA AND ADENOVIRUSES, Akademiya Meditsinskikh Nauk SSSR. G. P. Yakovleva, and A. P. Il'nitskii. Hygiene and Sanitation, Vol 32, No 12, p 330-333, Dec 1967. 1 tab, 7 ref.

Descriptors: "Water treatment, "Public health, "Ozonation, Temperature, "Pathogenic bacteria, "Viruses, "E. coli. Identifiers: "Shigella strains, Flexner's bacillus No 1402, Newcastle-Manchester bacillus No 687, "Adenoviruses.

When the original concentration of E. coli in ozonated water was 10 times higher than that of Shigella, visble E. coli remained even after complete destruction of the Shigella strains. E. coli is a reliable indicator of the efficiency of disinfection for water containing drug-resistant strains of Flexner's bacillus No 1402 and Newcastle-Manchester bacillus No 687. Ozone has a marked inactivating effect on adenoviruses. Its efficiency depends upon the initial concentration of virus and upon temperature. Temperature variations of 5 to

Group 5F-Water Treatment and Quality Alteration

7 deg do not significantly affect the inactivation of adenoviruses by ozone, but the disinfecting effect of coonation on water contaminated by denoviruses is less satisfactory at higher temperatures. (Bean-AWWARF)

HYGIENIC ASSESSMENT OF THE DISINFEC-TION OF DRINKING WATER WITH FREE AND COMBINED ACTIVE CHLORINE, Akademiya Meditsinskikh Nauk SSSR. M. A. Gubar, and N. D. Kozlova. Hygiene and Sanitation, Vol 32, No 5, p 163-167, May 1967. 2 fig, 1 tab, 9 ref.

Descriptors: *Water treatment, *Public health, *Chlorination, *Coliforms, Bacteria, Taste, Odor, *Disinfection, *E. coli, Organoleptic properties,

Experiments performed on water contaminated with different concentrations (30,000 – 300,000) of E. coil per liter, showed that on action of free chlorine of 0.5 – 1.0 – 1.5 mg/l, less bacteria remained than after the action of combined chlorine, taken at the same concentrations. Water chlorination for 30 min, with residual chlorine at the level of 0.5 mg/l (free) and 1.0 mg/l (combined) provides water which conforms to the requirements of hygienic standards in respect to organoleptic properties and to the degree of water decontamination on condition that one liter of initial water contains on the average not more than 10,000 E. coli. In case of a higher bacterial contamination of the water a more intensive chlorination is required. (Bean-AWWARF)

THE VALUE OF E. COLI AS AN INDICATOR OF ADENOVIRUS CONTAMINATION, Akademiya Meditsinskikh Nauk SSSR.
A. P. Il'nitskii.

Hygiene and Sanitation, Vol 31, No 2, p 162-166, Feb 1966. 2 fig. 3 tab, 9 ref.

Some 10 different species of virus may be spread by water. These include the adenoviruses, the first strains of which were isolated by Rowe et al in 1923, and of which 30 serological types have been isolated. Droplet infection is the main method of spread of adenovirus infections. The possibility of their being spread by water has so far only been investigated in the case of two adenovirus infections. The treatment and survival of some of the adenoviruses were tested. Conclusions were (1) type 3, 4, and 7a adenoviruses are capable of retaining their activity in nonsterile tap water and on a pond for at least 10 days, (2) chlorine and ozone have a pronounced inactivating effect on these adenoviruses, (3) the chlorine sensitivity of adenoviruses varies with the type, and (4) E. coli is a satisfactory indicator of the purification of water containing adenviruses by chlorine or ozone. (Bean-AWWARF)

INVESTIGATION OF POSSIBLE TOXICITY OF WATER DESALINATED BY THE ELECTROIONITE METHOD, Nauchno-lasledovatelskii Institut Gigieny, Moscow (USSR).

N. G. Lappo, R. A. Shtukovskaya, R. A. Ryazanova, and S. N. Gvozdeva. Hygiene and Sanitation, Vol 31, No 1, p 23-26, Jan 1966. 1 tab.

Descriptors: *Water treatment, Organoleptic properties, Organic matter, *Activated carbon, *Toxicity, Taste, Odor, Pilot plants, *Desalination.

Identifiers: *Electrojonic desalination.

The quality of water, freshened by the electroionite method on the ionite membranes of MK-40 and MA-41 trade marks, was assessed by chemical and toxicologic analyses. After freshening, the concentration of salts in the water decreased by 90-95 per cent. No passage of organic substances from the ionite membranes to the freshened water caused no change in the investigated organs and systems of experimental animals. The water, freshened by the electroionite method, obtained a positive hygienic evaluation; the water quality complied with requirements of the standard. The standard chemical and toxicological examinations of water desalinated by the electroionite method showed it to be free of taste and odor, chemically pure and nontoxic, provided that it was additionally filtered through activated birch-charcoal. It is recommended that water desalinated in this manner be tested in an experimental desalination installation of industrial type, under conditions similar to those in full-scale plants. (Bean-AWWARF)

HYGIENIC ASSESSMENT OF WATER DESALINATED BY EVAPORATION, Ministersive Zdravookhraneniya SSSR, Moscow. L. I. El'piner, A. I. Bokina, and Yu. B. Shafirov. Hygiene and Sanitation, Vol 34, No 6, p 341-346, June 1969. 2 fig. 11 ref.

Descriptors: *Water treatment, *Desalination, *Distillation, Organoleptic properties, Taste, Odor, Public health, Potable water. Identifiers: Mineralized water.

According to the results of the investigations, completely demineralized desalinated water cannot be regarded as potable. There is a need for physiologically substantiated recommendations for the artificial mineralization of sea water and brackish waters which have been desalinated by thermal methods, and for corresponding technological recommendations. The organoleptic properties of distilled waters are extremely disagreeable. Distilled waters are extremely disagreeable. Distilled water causes changes of the gastric secretion in dogs. Its short term administration to rats produced a decrease of weight of the thymus gland and a fall of ascorbic acid content of the suprorenal glands. Consumption of distilled water by animals for a long period of time was accompanied by disturbances of the metabolism of minerals, especially that of chlorine. Physiological recommendations for mineralization of distilled water should be elaborated. (Bean-AWWARF)

ARRANGEMENT FOR WATER TREATMENT, For primary bibliographic entry see Field 05D. W73-01837

WATER-DEMINERALIZING APPARATUS
WITH A CENTRAL REGENERANT COLLECTING AND DISTRIBUTING DEVICE,
Permutit Co. Ltd., London (England). (assignee).
For primary bibliographic entry see Field 03A.
W73-01838

WATER TREATMENT SYSTEM, J. A. Schleimer, and A. M. Beavens. U. S. Patent No. 3,592,212, 5 p, 6 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 888, No 2, p 436, July 13, 1971.

Descriptors: *Patents, Electrical equipment, Alkalinity, Conductivity, *Corrosion control, *Water treatment, *Scaling, Water purification, Water quality control, Equipment, Hydrogen ion concentration, *Automatic control. This water treatment system includes a scanner circuit which controls other component circuits such as a pH control circuit, a conductivity control circuit, and a corrosion rate circuit. Signals are sent out by each of these component circuits to the scanner which monitors the signals and takes corrective action when needed and terminates that action when it is no longer needed. (Sinha-OEIS) W73-01847

5G. Water Quality Control

SUMMARY OF WATER QUALITY STAN-DARDS FOR INTERSTATE WATERS OF KAN-

Kansas State Board of Health, Topeka, Div. of Environmental Health.

Joint report of Environmental Protection Agency and Kansas State Department of Health Report, April 1972. 33 p, 11 fig.

Descriptors: "Water quality standards, "Water pollution control, "Kansas, "Federal government, Interstate rivers, Pollution abatement, Water quality, Regulation, Water policy, Water quality act, Waste disposal, Water pollution treatment, Water quality control.

In the Water Quality Act of 1965, Congress authorized the establishment of water quality standards for interstate (including coastal) waters. Kansas adopted standards for its interstate waters on May 31, 1967, which were then submitted to the Department of the Interior. Revisions of the water quality standards were adopted by the Kansas State Board of Health on January 8, 1971, and were approved, as amended, on March 5, 1971, by the Administrator of the Environmental Protection Agency. The standards consist of three major components: designation of the uses which interstate waters are to serve, specification of narrative and numerical criteria to protect and enhance water quality, and specification of a plan of implementation and enforcement, which includes treatment and control requirements for municipal, industrial and other wastes discharged to or affecting interstate waters. These components are discussed. (Woodard-USGS)

WASTEWATER RECLAMATION IN SOUTHERN CALIFORNIA, California State Dept. of Water Resources, Los Angeles. Southern District.
For primary bibliographic entry see Field 05D. W73-01347

COMPUTERIZED MONITORING SYSTEM HELPS SAN FRANCISCO CONTROL OVER-FLOW.

Water and Sewage Works, Vol 119, No 8, p 44-45, August 1972.

Descriptors: *Combined sewers, *Urban runoff, Sewage (Urban), *California, *Monitoring, *Overflow.

Identifiers: *Computer monitoring, *San Francisco (Calif).

The present combined sewer system, under unpredictable rain conditions, dumps untreated sewage and rain runoff into the bay and ocean. It is as high as 68% of the total runoff derived from the city. In order to meet the pollution control objectives of State Regional Water Quality Control Board, the engineers have to come up with an effective modification of the present system. This required the complete patterns of rainfall and sewage flows in different parts of the city at different times over quite a few years. A \$360,000 computerized system with 16,384 words of core memory, central

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processor and two magnetic tape drives collects the realrtime data from 30 rainfall stations and 113 sewer locations over 143 voice grade communications lines, thus examining storm classification and sewer system response characteristics throughout the city. These data are also periodically sent to a larger computer system to perform the data sorting and analysis routines. The system already in operation for a year should over the next two-three years be able to develop historical response characteristics tables which could be helpful in designing an automatic real-time rainfall activated, computer controlled system for the control of combined sewer overflows. (Morparia-Texas)

CONTROL OF MALODORS FROM KRAFT RECOVERY OPERATIONS BY PYROLYSIS, California Univ., Berkeley.

Cantorna Omv., Berkeley. K. H. Jones. Available from University Microfilms, Ann Ar-bor, Michigan, Xerox Copy \$6.00, Microfilm \$3.00, Order No 69-3626. Ph. D. Dissertation, 1968.

Descriptors: *Air pollution, Odor, Industrial wastes, Pilot plants.
Identifiers: *Pyrolysis, *Malodors, Kraft mills, Odor control

The kraft mills recovery furnace and its associated direct contact evaporator, being grossly over-loaded and/or inadequately designed, was found to be the source of malodors in the mills. These existbosed and/or macequately designed, was found to
be the source of malodors in the mills. These existing recovery mills cannot carry out to an acceptsble degree of completion the complex steps of
evaporation, sublimation, pyrolysis, recombination, and oxidation. The pyrolysis and recombination ateps of concentrated black liquor were studied over a wide temperature range to describe the
variables influencing malodorous emissions.
Preliminary experiments using sods pulping liquor
with various inorganic sulfur salts added were useful in describing hydrogen sulfide and organic sulfur compound production. Obtained from the comprehensive data, the basis for optimizing the
process was put into effect as a continuously
operated pilot plant. Several hypotheses concerning production mechanisms and the presence of
several uncommon malodorous compounds were
substantiated. (Anderson-Texas)
W73-01333

STATE ENVIRONMENTAL UTILITIES FOR WASTE MANAGEMENT, Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
J. M. Armstrong.
J. M. Armstrong.
Journal Water Pollution Control Federation, Vol 44, No 9, p 1763-1777, September 1972. 1 fig, 1 tab,

Descriptors: *Public utilities, *Waste treatment, Water quality control, Water quality standards, Legislation.

Identifiers: *Environmental utilities, *Waste con-trol.

State controlled environmental utilities charged with responsibility for enforcement of standards and operation of regional facilities can improve the efficiency of waste control programs now and operation of regional facilities can improve the efficiency of waste control programs now operated by municipalities, and private industries. The environmental utility could charge rates to customers who would receive the benefit of not having to operate treatment plants. Economy of scale, centralized staff, and coordinated planning would reduce the cost and increase the effectiveness of the waste control programs. In addition, the state utility would offer financing and technical assistance to municipalities and industries. Similar agencies are operating in New York, Maryland, Ohio, and Ontario. A detailed organization model with proposed legislation for creating the utility is presented, including rate setting functions, financing, technical services, rights of municipalities and persons, and appellate functions. (Anderson-Texas)
W73-013-56

LISTEN. PHOSPHATE REMOVAL ISN'T THE

ANSWER, Kappe Associates, Inc., Rockville, Md. S. E. Kappe. Water and Waste Engineering, Vol 9, No 4, p 38-43. April 1972. 6 ref.

Descriptors: "Phosphates, "Silting, "Sedimenta-tion, Nutrients, Waste water analysis, Water quality control, Detergents, Alkali, Sludge disposal, Waste water treatment. Identifiers: "Phosphorus removal.

Evaluation of present pollution problems would seem to indicate that damage caused by the use of alkali detergents and by the tons of organic-laden sediment which has been and is being washed daily into waterways from urban and rural erosion is into waterways from urban and rural erosion is much greater than the damage caused by phosphate pollution. It is recommended that money now being spent for phosphate removal be used to: (1) reduce infiltration and rainfall drainage into the sewerage collecting systems, (2) balance the flow of influent through treatment works so that treatment efficiency is not affected, (3) remove not only readily biodegradable wastes, but also the more exotic organic-inorganic compounds and trace metals, and (4) to solve, rather than increase, the sludge disposal problem. (Smith-Texas) as) W73-01364

CORROSION AND THE WATER SUPPLY EN-

Australian Corrosion Association. Victorian Branch. For primary bibliographic entry see Field 08G. W73-01374

THE USE OF FERTILIZERS UNDER IRRIGA-TION IN ROMANIA, (IN RUSSIAN), For primary bibliographic entry see Field 03F. W73-01386

CONTROL OF EURASIAN WATERMILFOIL (MYRIOPHYLLUM SPICATUM L.) IN TVA RESERVOURS (DRAFT ENVIRONMENTAL IM-FACT STATEMENT). Tennessee Valley Authority, Chattanooga. Office of Health and Environmental Section.

Available from the National Technical Informa-tion Service as PB-206 768-D, \$3.00 in paper copy, \$9.95 in microfiche. February 16, 1972. 32 p, 1 fig, 1 map, 2 photo, 9 tab, 13 ref, 2 append.

Descriptors: *Environmental effects, *Aquatic weeds, *Aquatic weed control, *Herbicides, *2-4-D, Weeds, Weed control, Aquatic plants, Tennessee Valley Authority, Tennessee River, Aquatic productivity, Water quality control, Water pollution sources, Water management (Applied). Identifiers: *Environmental Impact Statements, *TVA reservoir system, *Eurasian watermilfoil.

The proposed action is a continuing annual program to control growth of Eurasian Watermilfol (Myriophyllum Spicatum L.) in the Tennessee Valley Authority reservoir system by application of 2,4-D herbicide and water level management. The action will result in the return of the reservoirs and action will result in the return of the reservoirs and contiguous lands to maximum uses and possible increased production of sport fish. Adverse en-vironmental effects include possible low concen-trations of herbicides in water supplies, minor damage to non-larget aquatic and terrestrial plants, minor loss of food and shelter for some fish species, minor loss of food and resting area for waterfowl, and possible decreased fish spawning resulting from water level drawdown. Alternatives include no control, mechanical control, biological control, use of water level management alone, use of 2.4-D alone, and use of other herbicides besides 2.4-D. (Wheeler-Florida) W73-01390

PELICAN BUTTE SPORTS DEVELOPMENT, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Forest Service (USDA), Portland, Oreg. Pacific

Northwest Region.
For primary bibliographic entry see Field 04A.
W73-01416

PENNSYLVANIA JOINT COMMITTEE RE-PORT ON TOCKS ISLAND, Senate, Washington, D. C. For primary bibliographic entry see Field 06E. W73-01421

WATER POLLUTION CONTROL BILL, ouse, Washington, D. C. r primary bibliographic entry see Field 06E.

PRESIDENT'S ENVIRONMENTAL LEGISLA-TIVE PROGRAM, Senate, Washington, D. C. For primary bibliographic entry see Field 06E. W73-01424

THE BLUE RIDGE POWER PROJECT. House, Washington, D. C. For primary bibliographic entry see Field 06E.

POPULATION DYNAMICS OF THE COHO SALMON AND ITS RESPONSE TO LOGGING IN THREE COASTAL STREAMS,

Oregon State Univ., Corvallis D. W. K. Au.

Available from Univ. Microfilms, Inc., Ann Arbor, Mich., 48106, Order No 71-31, 104. Ph D. Thesis, 1972, 258 p.

Descriptors: *Fish population, Fish barriers, Fish behavior, Salmon, Smolt, Fry, Juvenile fish, Growth, Fish reproduction, Life cycles, Growth Fisher Migration, Biomass. Productivity, En-Growth, Fish reproduction, Life cycles, Growth stages, Migration, Biomass, Productivity, Environmental effects, Streams, Retaining walls, Watersheds, Watershed management, Clearcutting, Cutting management, Ecology, Secondary productivity.

Identifiers: *Coho salmon, Patch cutting, Oncorhynchus kisutch.

hynchus kisutch.

Two small watersheds in Oregon's Coast Range were logged in 1966, one clear-cut, the other patch-cut. Another adjacent watershed was used as a control in assessing the influence of those activities on the biology of the coho salmon (Oncorhynchus kisutch). Attention was concentrated on populations of the 6 year classes 1963-1968. It was found that growth, biomans, and net production varied greatly each year. Productivity averaged 5 g/sq meter among the 3 streams for the period June 1 to April 15. The populations seem naturally regulated, especially with respect to number. The study shows that coho streams normally produce characteristic levels of smolt yield in spite of large natural variations in fry input and in growth conditions. The range of environmental variation applicable may include short-term changes due to logging, but a program that at least contains vigorous stream clearance, restriction of additional mortality to early summer, and encouragement of streamside revegetation in necessary for normal population response to such severe altera-

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tions. A streamside buffer strip of trees provides an effective way of protecting aquatic resources. (Mackan-Battelle) W73-01426

AN EVALUATION OF WATER POLLUTION CONTROL IN AND BY THE STATE OF OKLAHOMA, Oklahoma Univ., Norman.
W. D. Johnson, and J. E. Reese.
Available from Univ. Microfilms, Inc., Ann Arbor, Mich., 48106 Order No. 72-3402. Ph. D. Thesis, 1971. p 301.

Descriptors: *Water pollution control, *Oklahoma, Water quality, Standards, Economic efficiency, Cost analysis, Water quality act, Legislation.

This study examines Oklahoma's response to the Water Quality Act. Initially, the evolution of water pollution control laws in Oklahoma on an agency basis from territorial days to the snouths preceding the passage of the federal law is described. The restructuring of the legal and organizational framework to conform with the federal requirements is then analyzed and a thorough examination is made of the financial status of the state's water quality control program. As a result of the investigation of the present system, alternatives are advanced for its reorganization. The end objective is to establish a program whereby avoidance of pollution through planning will replace abatement activity and the improvement of stream quality rather than its maintenance is achieved. (Mortland-Battelle)

AERATION APPARATUS, Keene Corp., Aurora, Ill. Water Pollution Control Div. (assignee).

For primary bibliographic entry see Field 05D.

PROCESS FOR THE REMOVAL OF OIL FROM THE SURFACE OF A BODY OF WATER, Morris (Phillip), Inc., New York. (assignee).

U. S. Patent No. 3,674,683, 3 p, 3 ref; Official Gazette of the United States Patent OFFICE, Vol 900, No 1, p 265, July 4, 1972.

Descriptors: "Patents, "Oil spills, "Oil pollution, "Pollution abatement, Treatment, "Polymers, Water quality control, Water pollution control, Water pollution, "Absorption, "Coagulation. Identifiers: Vinyl chloride.

A material which is absorbed by the oil but not wet by water is applied to oil on the surface of water to coagulate and collect oil. The material consists of a hydrophobic vinyl chloride polymer having a microporous open matrix. The material floats on water and is absorbed into the oil thickening it to a semi-solid form which can be collected and removed by mechanical means, or if desired, caused to sink to the bottom of the water. (Sinha-OFTE) OEIS) W73-01526

AFFARATUS AND METHOD FOR AERATING WASTE MATERIAL, The Standard Products Co., Cleveland, Ohio. (as-

signec). For primary bibliographic entry see Field 05D.

METHOD AND APPARATUS FOR THE MICKODISPERSION OF OXYGEN IN WATER, Air Reduction Co., Inc., New York. (assignee). W. B. Laird, R. L. Williams, and A. V. Muska.

U. S. Patent No 3,671,022, 4 p, 4 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 899, No 3, p 1003, June 20, 1972.

Descriptors: *Patents, Equipment, *Pollution abatement, *Dispersion, Rivers, Streams, Surface waters, *Oxygenation, Water pollution control, Water pollution treatment, Water pollution, Water quality control. Identifiers: *River pollution.

An open-ended conduit is provided with an impeller for driving reasonably large quantities of water through it. An auxiliary water supply system pulls in volumes of water. Means are present for oxygenating the auxiliary water close to the point at which injection into the main flow of the conduit occurs. Oxygenation takes place under the pressure conditions present at river bottom. (Sinha-OEIS)
W73-01532

APPARATUS FOR REMOVING OIL FROM A

APPARATUS FOR REMOVING OIL FROM A BODY OF WATER, F. E. Hale, Jr., and E. Hale, Sr. U. S. Patent No 3,670,896, 3 p, 7 fig, 7 ref; Official Gazetie of the United States Patent Office, Vol 899, No 3, p 972, June 20, 1972.

Descriptors: "Patents, "Oil pollution, "Oil spills, Equipment, "Pollution abatement, Water quality control, Water pollution control, Water pollution, Separation techniques, Water pollution treatment. Identifiers: "Water repelling material.

The apparatus consists of a collection device having a relatively amooth surface coated or otherwise formed of a material including a high molecular weight hydrocarbon or similar material which is wettable with oil but repellent to water. The collector is moved in and out of the water. The adhering oil is wiped from the surface and piped to a suitable reservoir. (Sinha-OEIS)

UNDERWATER POLLUTION CONTROL, Esso Production Research Co., Houston, Tex. (as-

signee). T. W. Childers.

1. W. Childers.
U. S. Patent No 3,670,814, 6 p, 16 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 899, No 3, p 951, June 20, 1972.

Descriptors: *Patents, *Oil pollution, Leakage, *Pollution abatement, Water pollution control, Water quality control, Oil fields, Water pollution. Identifiers: *Oil well leakage.

The capture and confinement underwater of oil escaping into the sea from one or more submerged well structures are provided by an apparatus extending over the structure. The device consists of a roof having side curtains. It is remotely operated. A fluid conduit opened by an oil-water interface-level detecting device drains oil below the roof to a production conduit of the well. Attainment of a predetermined minimum level may actuate electrical circuitry provided for connection to an indicator placed at a remote accessible location, signalling the occurrence of oil leakage. (Sinha-OEIS)

APPARATUS FOR REMOVING OIL FROM

WATER, Hercules Inc., Wilmington, Del. (assignee).

N. E. Downs. U. S. Patent No 3,669,275, 3 p. 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 899, No 2, p 560, June 13, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, *Pollution abatement, *Pipes, Separa-tion techniques, Water quality control, Water pol-

lution treatment, Water pollution control, Water

An apparatus is provided by which water is prevented from entering into the pipes employed for pumping off the oil gathered from the surface of the water. A flexible water impervious shell, installed over the fibrous body in the area of the perforated pipe or pipes completely eliminates water from the recovered oil. (Sinha-OEIS) W73-01540

APPARATUS FOR COLLECTING OIL FROM THE SURFACE OF A BODY OF WATER, W. H. Daniel. U. S. Patent No 3,667,609, 3 p, 6 fig. 3 ref; Official Gazette of the United States Patent Office, Vol 399, No 1, p 144, June 6, 1972.

Descriptors: "Patents, "Oil spills, "Oil pollution, Equipment, Separation technique, "Pollution abatement, Water pollution, Water pollution con-trol, Water pollution treatment. Identifiers: Airborne delivery.

A tent-like structure is immersed a short distance below the surface of the water. Wave action agitates the water and drives oil globules and bodies beneath the tent. The oil rising in the tent separates from the water and collects at the top of the tent. Hydrostatic pressure forces it upward through a conduit and into a container for collection. The equipment in the shape of a parachute may be airborne for delivery where required. (See also W73-01544) (Sinha-OEIS)

APPARATUS FOR COLLECTING OIL FROM THE SURFACE OF A BODY OF WATER, W. H. Daniel.

W. H. Damel. U. S. Patent No 3,667,610, 3 p, 7 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 899, No 1, p 144, June 6, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, Separation techniques, *Pollution abatement, Water pollution, Water pollution con-trol, Water pollution treatment, Water quality con-

A tent-like structure is immersed from a position above the surface of the water to a position below the surface. This confines an area of oil and forces it downward. The area of the submerged oil patch is then decreased by the tendency of the oil to move to the top of the tent-like structure. The oil flows into the lower portion of a vertical conduit and flows upward under hydrostatic pressure. The tent-like structure is repeatedly raised and lowered, repeatedly gathering in the oil and forcing it upward into the conduit for collection. (See also U. S. Pat No. 3,667,609 by the same inventor) (See W73-01543) (Sinha-OEIS)

APPARATUS FOR REMOVING OIL SPILLS FROM THE SURFACE OF A BODY OF WATER,

WATER, Hercules Inc., Wilmington, Del. (assignee). R. H. Burroughs, and P. R. Cox, Jr. U. S. Patent No 3,667,608, 4 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 899, No 1, p 144, June 6, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, *Pipes, Equipment, Water pollution control, Water pollution treatment, Water quality control, Separation techniques. Identifiers: *Wicking, *Polyolefin fiber.

Oil and gasoline can be removed from the surface water of rivers, lakes, bays, and oceans by utiliz-ing the selective wicking ability of polyolefin fiber for oil. A perforated pipe is wrapped with one or

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more layers of polyolefin fiber. Pumping fittings are embedded within the pipe for removal of the oil. The pipe, preferably flexible, may vary in size and being flexible may be adapted to various shapes to surround a spill. (Sinha-OEIS) W73-01545

SUBMERGED OIL LEAK CONTROL.

R. O. Zielinski. U. S. Patent No 3,667,605, 3 p. 3 fig. 3 ref; Official Gazette of the United States Patent Office, Vol 899, No 1, p 143, June 6, 1972.

Descriptors: "Patents, "Oil pollution, "Leakage, Oil, "Pollution abatement, Equipment, Oceans, Water pollution control, Water quality control. Identifiers: "Ocean floor, "Oil leakage.

A cylindrical and cup-shaped casing is placed in an inverted position upon the ocean floor to cover the upper end of a broken oil casing or a crack in the ocean floor through which oil is leaking. Tubular parts are connected coaxially to the top wall of the casing and extend upward. The lowermost part is linked with the interior of the casing through the top wall. Anchors are placed on the floor around the casing and are connected by cables to the tubular parts to prevent side sway. (Sinha-OEIS) W73-01546

CONVERTIBLE BARRIER FOR SUBSTANCES

FLOATING ON WATER, P. Preus, and J. J. Gallagher. U. S. Patent No 3,667,235, 3 p, 7 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 899, No 1, p 48, June 6, 1972.

Descriptors: "Patents, "Oil spills, "Oil pollution, "Barriers, "Flotsam, Equipment, "Pollution abate-ment, Separation techniques, Water pollution, Water pollution control, Water quality control, Water pollution treatment.

A floating boom has a water impervious skirt for containing oil slicks in substantially still water and a water pervious skirt for containing oil slicks on water having wave or current movement. A barrier adapts to control oil slicks under any water condition by use of the appropriate type of skirt. The water pervious skirt is maintained in a flow interception position to act, with a particulate oleophilic-hydrophobic material less dense than water, to filter oil from the water flowing through it. (Sinha-OKIS) OEIS) W73-01547

SEPARATOR FOR LIQUIDS OF DIFFERENT SPECIFIC GRAVITIES, C. in'tVeld.

C. in tveal. U. S. Patent No 3,666,108, 3 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 898, No 5, p 1660-61, May 30, 1972.

Descriptors: "Patents, "Oily wastes, "Oil pollu-tion, Sand, Mud, "Liquid wastes, "Specific gravi-ty, "Gravity, Water pollution, Water pollution treatment, Water pollution control, Water quality control.

Identifiers: *Gravity separation.

This apparatus includes a tank having at least a part of its top wall serve as the upper end of a hopper-shaped hollow body. The mixture of liquids empties at about the half way mark. The lighter liquid rises above the heavier. A filter is placed between the tank bottom and the tank wall to remove remaining small oil particles from the water before it is removed by the suction device. Sand, mud or other impurities being carried in the mixture will sink to the tank bottom where a collecting reservoir or sump collects them separately. (Sinha-OEIS) W73-01549

AUTOMATICALLY OPERATED OIL SEPARA-

AUTOMATICALLY OPERATED OIL SEPARA-TOR SCUM TROUGH, W. P. Blanchard. U. S. Patent Number 3,666,102, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Of-fice, Vol 898, No 5, p 1659, May 30, 1972.

Descriptors: "Patents, "Oil pollution, "Oily wastes, "Liquid wastes, "Pollution abatement, Equipment, Waste water treatment, Water pollution treatment, Water pollution, water quality control.

An automatic timer system is provided for separating oil and water or other immiscible liquids. It consists of a settling tank into which the mixed liquids are delivered with the light liquids floating to the surface. A discharge line drains the heavier liquids from the tank to another collection tank and a rotatable, longitudinally slit pipe disposed at the surface of liquid drains off the floating oil or other lighter liquid. (Sinha-OEIS)

METHOD AND APPARATUS FOR COLLECTING OIL FROM AN UNDERWATER LEAK,

ING ULL FRUD T. A. Madej. U. S. Patent No 3,666,100, 3 p. 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 898, No 5, p 1658-59, May 30, 1972.

Descriptors: "Patents, "Leakage, "Oil pollution, "Pollution abatement, Equipment, Separation techniques, Water quality control, Water pollution, Water pollution control, Water pellution

The apparatus for collecting oil from a leak in the floor of a body of water consists of an inverted, hollow, heavy, or weighted collector shell in the form of an inverted funnel positioned directly over the leak. A vent conduit is used to direct gas and oil upwards for subsequent separation. (Sinha-OEIS) W73-01552

METHOD OF AND APPARATUS FOR SEPARATING LIQUIDS,

U. S. Patent No 3,666,099, 3 p, 8 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 898, No 5, p 1658, May 30, 1972.

Descriptors: *Patents, Equipment, *Pollution abatement, *Oil pollution, *Oily wastes, Water quality control, Water pollution control, Water pollution treatment, Separation techniques.

An inverted V-shaped trough is disposed at a relatively small angle to the horizontal intersecting the interface between a body of water and a substance of lesser density floating on it. The floating material is carried below the interface to a receptacle in which it is collected for removal. (Sinha-OEIS) W73-01553

APPARATUS FOR CONFINING A SLICK AND COLLECTING OIL THEREFROM, Deepsea Ventures, Inc., Newport News, Va. (as-signee) J. P. Latimer.

U. S. Patent No 3,565,254, 4 p, 9 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 883, No 4, p 1492, February 23, 1971.

Descriptors: "Patents, "Oil spills, "Oil pollution, "Pollution abatement, Water pollution, Water pol-lution treatment, Water quality control, Separa-tion techniques, Equipment. Identifiers: "Oil booms.

A method is described for buoyantly supporting the confining and collecting boom, which was pro-vided with lateral perforations for ingestion of oil. An air skirt was provided to prevent the ingestion

of air while withdrawing the oil alick into the boom. See U.S. Pat. No 3,666,098 for subsequent improvement of this equipment. (See W73-01535) (Sinha-OELS)

METHOD AND APPARATUS FOR CONFINING AND COLLECTING AN OIL SLICK, Deepsea Ventures, Inc., Gloucester Point, Va. (as-signee). C. Garland, J. J. Victory, and J. P. Latimer. U. S. Patent No 3,666,098, 4 p. 12 fig. 5 ref; Offi-cial Gazette of the United States Patent Office, Vol 898, No 5, p 1638, May 30, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, Water pollution, Water pol-lution treatment, Water quality control, Separa-tion techniques, Equipment. Identifiers: *Oil booms.

An improvement over U.S. Pat. No 3,565,254 is provided. In particular, the improvement is concerned with shielding of the lateral perforation in the boom to prevent air ingestion and to stabilize the boom in an attitude for ingesting of oil, instead of water. (See W73-01554) (Sinha-OBIS) W73-01555

CONTAMINANT CONTAINMENT METHOD AND APPARATUS,

U. S. Patent No. 3,665,713, 3 p., 10 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 898, No 5, p 1559, May 30, 1972.

Descriptors: "Patents, "Barriers, "Oil spills, "Oil pollution, "Jets, Flotsam, Equipment, Bubbles, Hydraulics, "Pollution abatement, Water pollution control, Water pollution, Water pollution treatment. Identifiers: *Hydraulic barriers.

A method is provided by which high pressure jets are operated in a predetermined configuration beneath the surface of the water so that their ac-tivation causes contaminants such as oil to be con-

beneath the surface or the water so that user activation causes contaminants such as oil to be contained within a limited and confined area. The rafflike structures are appropriately fastened together. A wave-guard, comprised of aluminum sheeting, is fastened so that excessive wave action may be diverted from the power unit. (Sinha-OEIS)

AERATING SYSTEM, Xodar Corp., Warwick, R.I. (assignee). For primary bibliographic entry see Field 05D. -01559

METHOD AND APPARATUS FOR DEPLOYING

A FLOATABLE BARRIER, Shell Oil Co., New York (assignee). R. R. Ayers, P. E. Titus, and J. R. Hanson. U. S. Patent No. 3,664,504, 3 p. 3 fig. 4 ref; Official Gazette of the United States Patent Office, Vol 898, No. 4, p. 1249, May 23, 1972.

Descriptors: "Patents, "Oil spills, Liquid waste, "Flotsam, Equipment, Separation techniques, Barriers, Water quality control, "Pollution abate-ment, Water pollution treatment, Water pollution, Water pollution control.

A method is provided for deploying a floatable barrier capable of controlling the spread of a liquid pollutant floating on a body of water. The barrier is initially collapsed in a storage location provided by a container which is subsequently retrieved for reuse. As the container is sunk the barrier floats out of the storage location and is deployed around the spill. (Sinha-OEIS)

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COLLECTING DEVICE FOR SUBMARINE OIL

COLLECTING DEVELS FOR SOME STATE OF STA

Descriptors: "Patents, "Oil pollution, "Leakage, Equipment, Separation techniques, "Pollution abatement, Water pollution, Water pollution treat-ment, Water quality control, Water pollution com-

The device for collecting oil leaking from formations beneath a body of water is constructed of flexible, impervious sheet material for compact storage that can be readily erected for use by inflation. It has a pair of predetermined upper and lower torus-shaped envelopes connected by a frusto-conical shroud. The lower eavelope has a larger diameter and is adapted to be filled with a non-buoyant material to distend it and to open the shroud causing it to circumscribe the point of leakage. An oil collector is situated so as to direct the oil from the point to the surface. (Sinha-OEIS) W73-01561

IMMISCIBLE LIQUID SEPARATING AP-

PARATUS, Ocean Pollution Control, Inc., Dallas, Tex. (as-

U. S. Patent No. 3,662,892, 3 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 898, No 3, p 871, May 16, 1972.

Descriptors: *Patents, Equipment, *Pollution abatement, Separation techniques, *Oily wastes, *Oil pollution, *Liquid wastes, Waste water treatment, Water pollution, water pollution, Water quality control.

This apparatus includes a body having side walls which extend downward into the liquids and terminate below the interface of the two liquids. The side walls are connected beneath the interface. A weir extends between and is positioned transversely of the side walls. The top of the weir is positioned below the liquids interface so that the predominant portion of the lighter of the two liquids will flow over the weir. The first chamber has an aspirating slot which is shaped so that upon movement relative to the liquids suction is created to withdraw the heavier liquid through the slot. (Sinha-OEIS)

MIXING OF WATER SUPPLY RESERVOIRS FOR QUALITY CONTROL, Bureau of Water Hygiene, Cincinnati, Ohio. J. M. Symons, J. K. Carswell, and G. G. Robeck. Journal of American Water Works Association, Val 67, No 5, p 322-334, May 1970. 31 fig, 3 tab, 15

Descriptors: *Destratification, *Stratification, *Impoundments, *Pumping, *Reservoirs, *Mixing, Public health, Water quality, Denaity, Temperature, Lakes, Iron, Manganese, Water quality control, Water supply development, Dissolved oxygen, Plankton, Oxygenation, Efficiencies. Identifiers: *Artificial destratification, *Thermal stratification, Oxygenation capacity, Dissolved oxygen profiles.

The results of experiments show that artificial destratification, although not the only engineering technique for raw-water quality control, improves water quality in many ways, thereby reduces the burden on a water treatment plant, and does not worsen it in any way. Some of the conclusions follow: (1) Bringing hypolimnion water to the surface of a reservoir with a mechanical or diffused-air pump eliminated thermal stratification. (2) Artificial destratification added DO to the water and oxidized any reduced substances such as iron, man-

ganese, and sulfide. (3) Plankton populations decreased temporarily during reservoir mixing and were shifted in predominance toward green algae. (4) Periodic mixing maintained good-quality water better than one mixing. (5) Reservoir water quality control should begin in the spring or early summer and should be continued throughout the summer to prevent any quality deterioration. (Oleszkiewicz-Vanderbilt)
W73-01564

THE PREVENTION OF STRATIFICATION IN

RESERVOIRS, P. Cooley, and S. L. Harris. Journal of the Institution of Water Engineers, Vol 8, No 7, p 517-537, November 1954. 7 fig, 3 tab, 3

Descriptors: "Stratification, "Mixing, "Reservoirs, "Density stratification, Jets, Rivers, Temperature, Model studies, Hydraulic models, Water resources, Inlets (Waterways), Hydraulics, Diffu-

Identifiers: *Repumping, *D Thames River, Lea River, England.

Two metropolitan water board reservoirs filled by the Thames and Lea Rivers have been studied with respect to their susceptibility to destratification. The experiments appear to show that stratification can be dispersed or prevented, and methods are presented for doing so in a particular case. These findings apply where a continuous inflow can be made to enter in jets. The proposed jets, formed of incoming water, would have two tasks: (1) to enter in and disperse large quantities of water from any stratified layer, and (2) by their direction and momentum to circulate the general body of water, carrying the new mixtures of water to all parts of the reservoir. The outlet would then draw a mixture of new and old waters from a current of water many times greater than its own volume. Thus the mean storage time would approach the greatest possible. (Oleszkiewicz-Vanderbilt)

TECHNICAL ASPECTS OF CONTROLLING WATER POLLUTION RESULTING FROM THERMAL POWER PLANTS WITH CONVENTIONAL AND NUCLEAR GENERATORS (ASPECTS DE NATURE TECHNIQUE QUE PRESENTENT, EN MATIERE DE PROTECTION DES EAUX, LE PRELEVEMENT ET LA RESTIT UTION D'EAU DE REFROIDISSEMENT POUR LES CENTRALES THERMIQUES CLASSIQUES OU ATOMIQUES). Departement Federal de l'Interieur, Bern (Switzerland).

Departement Federal de l'Interieur, Bern, Switzerland, 2nd edition, March 19, 1968. 146 p, 22 fig,

Descriptors: *Temperature, *Stratification, *Thermal pollution, Powerplants, Thermal powerplants, Nuclear powerplants, Reservoirs, Lakes, Rivers, Hydrologic aspects, Limnology, Fish, Bioassay, Toxicity, Criteria, Water quality, Water pollution. Identifiers: *Thermal regime, *Switzerland, Destratification, Lake zones.

Thermal pollution resulting from conventional and nuclear power plants is discussed with respect to water quality, stratification effects in reservoirs and lakes, effects on aquatic life and on the economy of water management in Switzerland. The problems of open versus closed cooling cycles in the power plants are discussed, followed by a description of atmospheric conditions influencing the thermal regime in surface waters. Hydrologic conditions in rivers and lakes are also presented. Methods for preventing stratification are discussed based on the experience in Germany, Switzerland, and the United States. Limnological

effects are reviewed with a detailed discussion of results of bioassay studies to determine tolerable temperature levels. (Oleszkiewicz-Vanderbilt) W73-01572

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COLD SPRING INLET, NEW JERSEY (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Philadelphia, Pa. For primary bibliographic entry see Field 08A. W73-01579

CHANGES IN ADMINISTRATIVE PROCEDURES MANUAL.
California State Water Resources Control Board,

California Administrative Procedures Manual, Revision Letter 6, p 20, 26, 27, 27a, 41, 43, C-1, C-2, D-2, D-3, F-1, F-2, added F-3 thru F-6, 1-1 thru 1-3 (May 15, 1972).

Descriptors: "Administrative agencies, "Water resources development, "Water quality control, Regulation, State governments, California, Permits, Administration, State jurisdiction, Water quality standards, Water resources, Water policy, Legal aspects, Governments, Water quality, Law enforcement.

The memorandum involves changes in the Administrative Procedure Manual, as of May 15, 1972, of the State Water Resources Coatrol Board of California. Changes involve monitoring of waste discharges, prohibitions and restrictions on additional connections to community sewer systems, immediate corrective measures, and cleanup orders. Revisions to Chapter Nine, Certification of Conformance with Water Quality Standards, include filing of requests, regional board staff procedures, and state board procedures. The memorandum also includes the revision or addition of certain appendices such as: Appendix C, Report of waste discharge; and Appendix C, Report of waste discharges and Appendix P, sample Cleanup Abatement Order; Appendix D, sample Order orders added include: Appendix P, sample Cleanup Abatement Order; Appendix D, sample Creanup Abatement Order; Appendix D, sample Creanup Abatement Order; Appendix D, sample Order orders and desist from discharging wastes. Also added is Appendix F involving procedures for processing filing fee for certification of conformance. This appendix includes definitions, administrative procedures, accounting procedures, receipting, deposits of money, and special receipting instructions. (Crow-Florida)

PRESIDENT'S MESSAGE ACCOMPANYING THE REPORT OF THE COUNCIL OF ENVIRONMENTAL QUALITY, For primary bibliographic entry see Field 06E. W73-01587

USE OF LATEX AS A SOIL SEALANT TO CONTROL ACID MINE DRAINAGE.
Uniroyal, Inc., Wayne, N.J. Research Center.

Copy available from GPO Sup Doc EP1.16:14010 EFK 06/7251.00; microfiche from NTIS as PB-213 040, 30.95. Environmental Protection Agency Water Pollution Control Research Series, June 1972. 84 p. 10 fig. 33 tab, 36 ref, append. EPA Pro-gram 14010 EFK 06/72. EPA Grant 14010.

Descriptors: *Water pollution control, *Acid mine water, *Soil sealants, *Surface sealing, *Water-proofing, Water pollution treatment, Laboratory tests, On-site tests, Rubber, Mine acids, Mining, Coal mines. Coal mines. Identifiers: *Latex.

Acid formation in a mine cavity can be prevented by keeping water (one of the reactants) out of the

mine. This might be accomplished by forming a waterproof seal over the mine cavity to prevent the seepage of surface water into the mine. In laboratory tests using reconstructed soil columns, rubber latex showed good sealing efficiency when applied at a rate equivalent to 4000-5000 pounds per acre. The ideal situation in which latex would coagulate in a narrow zone two to three feet below the surface by reacting with acidic or metallic constituents of the soil was not attained. Rather, in field tests the latex was deposited progressively as it passed through the soil (most of it remained in the top foot), the rate of deposition being dependent on soil structure and composition as well as no properties of the latex such as particle size and emulsion stability. Latex stability appears to be a more critical property than latex particle size in controlling penetration. Addition of excess anionic surfactants to latex improved its penetration into the soil. Raw material costs of latex at the application rates used in the field testing are in the order of \$1000 per acre. Dilute latex used on a slope of spoil bank material at an application rate of 400 lbs per acre (dry basis) stabilized the soil and made it much more resistant to washout by rainfall. (K-napp-USGS)

RESIDUALS CHARGES FOR POLLUTION CONTROL: A POLICY EVALUATION, Bowdoin Coll., Brusswick, Maine. Dept of Economics; and Wisconsin Univ., Madison. Dept. of Economics. For primary bibliographic entry see Field 06B. W73-01596

MATHEMATICAL MODELS IN WATER QUALITY MANAGEMENT, Duke Univ., Durham, N.C. For primary bibliographic entry see Field 05C. W73-01617

A PROGRAM FOR THE CONTROL OF CON-TAMINANTS IN NATURAL WATERS, Wisconsia Univ., Madison. Water Chemistry Lab. For primary bibliographic entry see Field 05C. W73-01618

RESEARCH SUPPLEMENT TO JOURNAL WATER POLLUTION CONTROL FEDERA-Water Pollution Control Federation, Washington,

Copy available from GPO Sup Doc EP1.16:16090 DQZ 06/71, \$0.45; microfiche from NTIS as PB-213 041, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, June 1971. 32 p, 6 tab, 12 ref, 4 append. EPA Program 16090 DQZ 06/71.

Descriptors: *Research and development, *Waste water (Pollution), *Waste water treatment, *Waste water disposal, *Publications, Water pollution, Water pollution control, Water pollution effects, Water pollution sources, Water pollution treatment, Water quality, Water resources.

Publication of a quarterly research supplement to Journal Water Pollution Control Federation with federal grant support was carried out from October 1967 to August 1970. This was an experimental effort to determine the fensibility of such a publication in developing its own self-sustaining support as an effective and economical means of disseminating research information to the water pollution control field. The 12 issues published in the three-year grant period proved to be an effective means of such dissemination and demonstrated an excellent method of creating a permanent, retrievable source of pertinent information. The project was not successful economically in that advertising and other revenues did not

reach anticipated goals. In the absence of self-sustaining income and the availability of continued federal support, the project was terminated in Au-gust 1970 at the end of the grant period. Each of the twelve (12) issues published contains eight to ten authored research papers on a variety of sub-jects and each is abstracted in English, French, German, Portuguese, and Spanish. All papers are indexed in the annual index of the Journal. (EPA

FISHERIES MANAGEMENT IN PERU, Universidad Nacional de Trujillo (Peru). Por primary bibliographic entry see Field 06B. W73-01642

CLEANING UP THE WATERWAYS, Corps of Engineers, Washington, D.C. T. R. Peterson. The Military Engineer, Vol 63, No 416, p 415-416, November-December, 1971.

Descriptors: Rivers, Harbors, *Rivers and Harbors Act, *Legislation, *Waste disposal, *Cleaning, *Industrial wastes, *Water quality control, *Permits, Water pollution control. Identifiers: *Army Corps of Engineers.

Development of public awareness of environmental concern for United States waterways is traced from the River and Harbor Act of 1889 to the present. Events between 1960 and 1970 are outlined which led to President Nixon's resurrection of the old River and Harbor Act as the keystone for a new pollution control program initiated December 1970. The Army Corps of Engineers role in protecting the environment through construction permits was validated by the Supreme Court's refusal on February 22, 1971, to review a lower court decision giving the Corps of Engineers authority to refuse private development in navigable waters solely because of harmful ecological effects. The Corps of Engineers permit system requiring industries to submit data on their waste discharges and waste treatment plans is described. (McEntyre-PAI) (McEntyre-PAI) W73-01649

A DROP IN THE OCEAN,
A. J. O'Sullivan.
Your Environment, Vol. 2, No 2, p 81-93,
Summer, 1971.

Descriptors: *Water pollution effects, *Oceans, Sewage, Industrial wastes, Radioactivity, Thermal pollution, Legislation. Identifiers: British Sea Fisheries Committees.

The study of experts of pollution in the marine environment requires an interaction with several disciplines, including chemistry, physical oceanography, sedimentology, ecology, bacteriology, physiology and toxicology. The most important marine pollutants and their efforts are described: domestic and agricultural wastes, industrial waste, oil, radioactive materials, and waste heat. Governments and the general public are now aware of the need for protective marine legislation, enforcement, and research. The problem of limited powers is exemplified by those of the British Sea Fisheries Committees. This committee power cannot be used to control general environmental degradation, public health risks or loss of amenity values; its control extends only to the territorial limit of 3 miles; its powers are subordinate to statutory powers of local authorities discharging sewage effluent; and it has little control over pollution coming from river discharges. (McEntyre-PAI) The study of experts of pollution in the marine en-

POLLUTION: THE CRIME OF THE TIMES, Coast Guard, Portland, Oreg.

R. F. Malm. In: Seminar Proceedings: Topics in Ocean Engineering, Winter Quarter 1971, p 38-73, Oregon State University, Engineering Experiment Station, Circular No. 41. 6 fig.

Descriptors: "Water pollution control, "Water Quality Act, "Legislation, "Coasts, Ships, Oregon. Identifiers: "U. S. Coast Guard, Willamette River,

Pollution problems of the United States coastal regimes are outlined and the role of the U.S. Coast Guard in combating these problems is discussed. Main duties of the U.S. Coast Guard are to: The coast Guard in combating these problems is discussed. Main duties of the U.S. Coast Guard are to: The coast Guard section, and assess civil penalties or recommend criminal action to the U.S. Attorney. The principal law under which the Coast Guard operates in these cases is the Federal Water Pollution Control Act, as amended by the Water Quality Improvement Act of 1970. Another law used is the Refuse Act of 1899. These laws are described and the example of the Coast Guard action when the tanker SS Houston struck the Shell Oil Company pier in the Willamette River at Portland, Oregon in 1971, resulting in gasoline and diesel fuel pipeline ruptures, is presented. (McEntyre-PAD) tyre-PAI) W73-01653

THE CASPIAN SEA CALLS FOR HELP, (CONTROL OF CASPIAN SEA POLLUTION URGED), For primary bibliographic entry see Field 05C. W73-01654.

THE BUCKS CREEK PROJECT NO. 619 -CALIFORNIA. (DRAFT ENVIRONMENTAL IM-PACT STATEMENT). Pacific Gas and Electric Co., San Francisco, Calif. For primary bibliographic entry see Field 08C. W73-01705

MYSTIC LAKE RELICENSING, PROJECT NO. 2301 - MONTANA. (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Montana Power Co., Butte. For primary bibliographic entry see Field 08C. W73-01706

REDUCING THE ENVIRONMENTAL IMPACT OF POPULATION GROWTH BY THE USE OF

OF POPULATION GROWTH BY THE USE OF WASTE HEAT,
Oak Ridge National Lab., Tenn.
S. E. Beall, Jr.
Paper presented at American Association for the Advancement of Science, Symposium on Reducing the Environmental Impact of Population Growth, Part 1, Chicago, Illinois, December 26, 1970. 18 p, 3 fig. 2 tab, 18 ref.

Descriptors: "Beneficial use, "Environment, "Cooling water, Powerplants, Heat, Human populations, Temperature, Efficiencies, "Thermal pollution, Evaporation, Agriculture, Costs, Heating, Air conditioning, Aquiculture.

Identifiers: "Waste heat, Energy center.

Results are summarized of a HUD-sponsored study of ways to reduce the thermal pollution which accompanies most electrical generating facilities. The approach assumes that a new power station can be designed for a new city to maximize the consumption of thermal energy and minimize pollution of the biosphere. Applications of low temperature heat for air conditioning, waste water reatment, snow melting, industrial processes, and agriculture were investigated. A concept is presented which would provide all the energy needs of a city with a population of 389,000 without discharging any heat to surface waters or the cooling towers at the power station. A very large greenhouse - poultry house - swine house

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area is proposed to serve the cooling tower func-tion while maintaining proper growth conditions for plants and animals. The energy center concept is feasible technically and economically, and could be a stimulant to the growth of new cities. (Upad-hyaya-Vanderbilt) W73-01711

HOW TO MAKE A PROPIT ON WASTE HEAT, Oak Ridge National Lab., Tenn. S. E. Beall, Jr., and G. Samuels. In: Transactions of the American Nuclear Society, Vol 13, No 1, Los Angeles, California, June 28-July 2, 1970, published Hinsdale, Illinois, 1970. 15 p, 5 fig, 9 ref.

Descriptors: "Cooling water, "Profit, Tempera-ture, Efficiencies, Foods, Greenhouses, Cat-fishes, Poultry, Powerplants, Plant growth, "Ther-mal pollution, Acreage. Identifiers: "Waste heat, Incentive, Pork.

The possibility of using warm water from power stations to control the temperature of plant and animal enclosures is examined. It is observed that below 20 C, catish grow slowly, if at all, whereas from 20 C to 30 C there is a remarkable increase in growth. The same is generally true for milk production, for chicken growth, and for swine growth. Plants vary in their temperature requirements but the range of 60 to 80 F is generally suitable for many plants. It appears that with the heat from a nuclear station, such as the 330-Mwe gascooled reactor being built near Denver, Colorado, a good fraction of the fresh vegetable, poultry, and pork aceds of a large city could be produced in a growing area near the power station. It is estimated that grower's profit from heat cost savings could be 4 to 8 thousand dollars per acre, depending upon the plant location. The utility, even if it guest be 9 to 8 thousand dollars per acre, depending upon the plant location. The utility, even if it gives away the heat, can save cooling tower capital and operating costs of 250,000 dollars or more per year for the given plant size. (Upadhyaya-Vanderbilt) W73-01716

ENVIRONMENTAL ENGINEERING PROGRAMS QUARTERLY TECHNICAL PROGRESS REPORT - JANUARY, FEBRUARY, MARCH 1971. MARCH 1971.
Hanford Engineering Development Lab.,
Richland, Wash.
For primary bibliographic entry see Field 05B,
W73-01717

MINING AT KONKOLA DIVISION, NCHANGA CONSOLIDATED COPPER MINES LIMITED, Nchanga Consolidated Copper Mines Ltd., Kon-kola (Zambia). THE WATER PROBLEM IN RELATION TO For primary bibliographic entry see Field 04B. W73-01727

1972 COMPENDIUM, STATE WATER POLLU-TION CONTROL AGENCIES WITH REGULA-TORY/POLICY-MAKING RESPONSIBILITY. Environmental Protection Agency, Washington, D.C., Office of Intergovernmental Programs.

Environmental Protection Agency Office of Intergovernmental Programs Publication, 1972, 167 p.

Descriptors: *Water pollution control, *Organiza-tions, *State governments, *Administrative agea-cies, *Indexing, Documentation, Regulation, Reviews, Water quality control, Water law, Pollution abatement.

Identifiers: *Water pollution control agencies,

This compendium identifies the policy making/regulatory bodies in each State, the District of Columbia, Guam, Puerto Rico, and the Virgin

Islands with water pollution control responsibilities. The format follows the uniform Federal regional configuration (Regions 1-10). The States located within each region are listed alphabetically. Each listing gives the composition of the agency (or agencies) of each State charged with administration of that State's water pollution control program and outlines its significant policy making and/or regulatory responsibilities. Also reflected are (1) the composition and membership of the principal boards or commissions having water pollution control responsibilities, (2) addresses of the members of such bodies and of other key administrators, and (3) appropriate other twith more direct water pollution control functions is provided in synopsis form. Finally, an appropriate organization chart is included for each State. (Woodard-USGS)

GUIDELINES FOR EROSION AND SEDIMENT CONTROL PLANNING AND IMPLEMENTA-

TION,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 04D.
W73-01773

MANAGEMENT SCIENCE AND GAMING IN WASTE MANAGEMENT, IBM Cambridge Scientific Center, Mass. P. N. Wahi, and T. I. Peterson. Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 98, No SA5, Paper 9253, p 693-706. October 1972, 3 fig, 3 tab, 3 append, 22 ref.

Descriptors: *Decision making, *Sanitary engineering, *Solid wastes, *Management, Computer programs, Simulation analysis, Mathematical models, Pollution abatement, Ecology, Waste disposal. Identifiers: *Refuse disposal, *Interactions

Gaming is used to explore the interrelationships of the numerous factors in waste management. Management science aids are introduced to guide Management science aids are introduced to guide decision making, and the game is devised for use within IBM; it is interactive, terminal-oriented, and programmed in APL. The game scenario treats the area of solid waste management, and it is directed to players with minimal knowledge of management science. Techniques include shortest route, transportation, and maximal flow problems; transports and treatment of the problems of the problems of the problems of the problems of the problems. route, transportation, and maximal flow problems; interactive, natural language communication, and prompting features are also included. Games can help the participants develop their ability to make difficult decisions in real life, evaluate new ideas, and introduce new techniques of decision makingall in a simulated environment. The basic distinction between gaming and simulation is explained. Described are solutions to three specific problems which are based on conventional management science techniques. The system which supports the game can be used to author other game scenarios. (Bell-Cornell)

WEEDS, PRELIMINARY SURVEY.
Agency for International Development, Washington, D.C. Office of Science and Technology.
For primary bibliographic entry see Field 04A.
W73-01794

THE ECONOMICS OF DISPOSAL POLLUTION AND RECYCLING, R. Gray.

Quarterly Review of Economics and Business, Vol 1, No 12, p 43-51, 1972. 3 charts.

Descriptors: *Pollutants, *Pollution taxes (Charges), *Waste disposal, Disposal, Economic efficiency. efficiency.
Identifiers: *Pollution, *Deposit
Economic incentives, Consumers' surpli charges

Economic incentives, Consumers' surplus.

Disposal pollution basically arises from the fact that certain products which are used in huge quantities by society are disposable once they are empty, worn out, or obsolete. They are treated as disposable by their owners because littering such products is the cheapest way of dealing with then after their purpose is served. A solution to the problem of disposal pollution would be to make the price of disposal pollution would be to make the price of disposal pollution adjusticant. The actual price of disposal would depend on the available alternatives. If it is cheaper to avoid pollution that to clean up after the polluters, make the price of disposal so high that the consumer returns the container rather than disposing of it. When cleaning up the pollution is the least cost option, a surcharge at point-of-sale to cover the clean-up costs would effectively internalize pollution costs. If avoidance represents the least cost option, a deposit system is called for. This approach to protecting or restoring the environment satisfies the equity standard that those who create costs should be responsible for them. (Settle-Wisconsin) W73-01795 costs shoul Wisconsin) W73-01795

WILL ECOLOGY KILL SMALL BUSINESS, McConkey (Dale D.) Associates, Norwood, Ma For primary bibliographic entry see Field 06C. W73-01796

WATER SUPPLY AND SEWERAGE. World Bank, Washington, D.C. For primary bibliographic entry see Field 06D. W73-01802

A NOTE ON ECONOMIC GROWTH AND EN-VIRONMENTAL QUALITY, Australian National Univ., Canberra. Swedish Journal of Economics, Vol 74, No 2, p 281-285, June 1972. 1 fig, 4 ref.

Descriptors: "Pollution abatement, "Pollutants, "Mathematical models, "Environmental effects, Equilibrium, Phase diagrams, Optimization. Identifiers: "Growth models, "Environmental deterioration, Steady-state.

deterioration, Steady-state.

A model for analyzing the problem of environmental degradation in the context of economic growth is developed. The aggregate production function is assumed to be a linearly separable concave function of capital and pollution. The separability assumption implies that the marginal product of capital is independent of the level of pollution in the system. The marginal product of capital is assumed to be positive but diminishing. Pollution has a negative marginal product, with further additions of pollution reducing output by more than earlier pollution. The community devotes a constant proportion of total output to investment in productive capital, which depreciates at a constant exponential rate. The use of capital in production generates pollution. The more capital that is used, the more pollution is generated. The stock of pollution, however, decays away at a constant exponential rate. Analysis with phase diagrams suggests that even if pollution is not actively controlled, it is possible that the economy will equilibrate, that is, move to a steady-state in terms of the pollution level and the capital stock. In general, this steady-state will not be optimal. Maximum welfare may be achieved by devoting some resources to pollution control. (Settle-Wisconsin)

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Water Quality Control-Group 5G

DYNAMIC ASPECTS ON THE USE OF PRICES FOR PROTECTING THE ENVIRONMENT, Stockholm Univ. (Sweden). M. Johannesson. Swedish Journal of Economics, Vol 74, No 2, p

286-291, June 1972. 1 fig.

Descriptors: *Pollutants, *Environmental effects, *Regulation, *Pollution taxes (Charges), Dynamics, Stability, Data collections, Optimization. Identifiers: *Dynamic models, *Iteration.

Economic theory suggests that the presence of external diseconomies (such as air or water pollution) requires policy intervention in order to attain
optimal resource allocation. In principle, public
authorities could determine the optimal allocation
of resources, which could then be attained through
appropriate direct controls or by the use of pollution taxes equal to the marginal social damage at
the optimal point. In practice it is very difficult to
obtain the optimal solution in this way. Consequently, a more practical iterative procedure is
examined to determine whether it converges
toward the unknown optimum; that is, whether a
sequence of trial and error steps will cause the
economy to approach the desired allocation of
resources. It is assumed that the authority will estimate only the value of the social marginal damage resources. It is assumed that the authority will estimate only the value of the social marginal damage and tax the polluting firms on the basis of the current damage level in each period. This method requires no centralized data on optimality conditions. A simple dynamic model suggests that if the slope of 'the marginal reduction cost curve' has greater absolute value than the slope of 'the damage curve,' then the economy will converge to the optimal level either with oscillations or monotonically. (Settle-Wisconsin) W73-01811

A LOCALIZED STUDY OF GRAY IRON FOUN-DRIES TO DETERMINE BUSINESS AND TRCHNICAL COMMONALITIES CONDUCIVE TO REDUCING ABATEMENT COSTS. Commins (J. A.) and Associates, Inc., Fort

Available from the National Technical Informa-tion Service as PB-209 291, \$3.00 in paper copy, \$0.95 in microfiche. January 1972. 177 p, 33 fig, 13 tab, 45 ref, 1 append. EPA Contract 68-04-0043.

Descriptors: *Pollution abatement, *Iron, *Industries, *Economic impact, *Regulation, Profit, Costs, Economies of scale, Financing, *Air pollu-

Identifiers: *Gray iron foundries, *Group procure-ment, Antitrust regulation, Pollution control.

Small gray iron foundries may be seriously affected by compliance with strict air pollution requirements. Consequently, a group approach to buying and financing pollution control equipment is investigated on the thesis that economies of scale both in purchase and in financing costs might be available to members of the group. The study found that there was no technological reason why the gas conditioning and control device portion of a total control system could not be common for foundries grouped primarily according to melt rate and the volume of blast and infiltrated air in their operations. Group procurement of such comand the volume of blast and infiltrated air in their operations. Group procurement of such components could save a group of ten foundries of ten ton-per-hour melt capacity about \$20,000 each. Furthermore, sizable savings would be available from group financing of pollution control systems. For instance, a ten-member group could save about \$15,000 for each member's financing charges if tax-free debentures are utilized rather than straight bank borrowing. However, it was not possible to establish that lenders would actually conduct business with a group. Also, such group activities may not be consistent with antitrust regulations. (Settle-Wisconsin)

ON THE DEFINITION OF INDICATOR COLI BACTERIA IN THE DRAFT PROJECT OF THE NEW GOVERNMENT STANDARD (GOST) FOR DRINKING WATER (INTENDED TO SUPER-SEDE GOVERNMENT STANDARD GOST 2874-

Nauchno-Issledovatelskii Moscow (USSR). G. P. Kalina.

O. P. Kalina. Hygiene and Sanitation, Vol 33, No 9, p 326-329, Sept. 1968.

Descriptors: Water treatment, *Public health, *Standards, *Coliforms, Bacteria, Water quality, Bioindicators, *Potable water.
Identifiers: *Indicator organisms.

The history of the use of B. coli as a sanitary indicator in standards of drinking water quality and the importance of the technique used for its determination are discussed. The features specific to the determination of the B. coli group are more reliable criteria of the water quality. Its introduction into the draft of a new standard for drinking water is recommended. (Bean-AWWARF) W73-01819

APPARATUS AND METHODS FOR OIL SLICK CONTAINMENT, D. P. Hoult, and J. A. Fay. U. S. Patent No. 3,593,526, 3 p, 4 fig, 3 ref; Offi-cial Gazette of the United States Patent Office, Vol 888, No.3, p.754, July 20, 1971.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, Separation techniques, *Pollution abatement, Water pollution control, Water quality control, Water pollution, Water pollution treat-Identifiers: *Booms (Pneumatic).

This method for oil slick containment involves the use of a segmented, pneumatic boom arranged in zigzag, accordian-pleated configuration. The angle between adjoining segments is between 120 and 20 deg. The minimum distance between adjacent apices is greater than wave-caused water moveapices is greater than wave-caused water invo-ment. The boom segments are submerged at a predetermined depth d in which d/a is in the range of 5 to 10, a being the value of wave amplitude. (Sinha-OEIS)

FLOTATION CONFINEMENT APPARATUS,

FLOTATION CONTRACTOR B. A. Trindle. U. S. Patent No. 3,592,008, 5 p, 12 fig, 6 ref; Offi-cial Gazette of the United States Patent Office, Vol 888, No 2, p 389, July 13, 1971.

Descriptors: *Patents, *Barrier, *Oil pollution, *Oil spills, *Flotsam, *Shore protection, Equipment, Pollution abatement, Water pollution coatrol, Water pollution, Water quality control, Separation techniques.

A floating confinement apparatus is designed to form a protective periphery to retain or keep out undesirable debris or matter such as oil. It consists of flotation sections, each being adapted so that a portion of it will extend above the water line when floating on water. The flotation section comprises a rectangular shaped shell having an elongated diamond-shaped cross section. A metal frame is secured to the shell and extends around its outer periphery. It is designed to confine spills or leaks around offshore oil rigs or to protect a shoreline from deposition of unwanted matter. (Siaha-OEIS) OEIS) W73-01848

RETAINER FOR FLOATING DEBRIS,

C. E. Renner.
U. S. Patent No. 3,592,007, 3 p, 6 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 888, No 2, p 388, July 13, 1971.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Barriers, Equipment, *Pollution abatement, *Flotsam, Water pollution control, Water pollution, Water quality control.

The floating retainer comprises an elongated depending skirt having upper and lower edges, a float section defined longitudinally along the upper edge of the skirt and a ballast section along the lower edge of the skirt. Inter-engaging male and female ends are provided to join collars for tying together two or more retainers. The retainer is designed to gather and retain floating debris of various kinds including oil; confining the contaminants for subsequent removal. (Sinha-OEIS)

ISOLATION DEVICE, Cerebro-Dynamics, Inc., Oklahoma City, Okla. (astignee). A. M. Crucet. U. S. Patent No. 3,592,006, 4 p. 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 888, No 2, p 388, July 13, 1971.

Descriptors: *Patents, *Oil slicks, *Oil pollution, *Flotsam, Equipment, *Barriers, *Pollution abate-ment, Water pollution control, Water pollution.

A buoyant elongated flexible barrier having closed fluid chambers is used to confine an oil slick or floating debris. A coupling device has a pair of slots to engage the elongate section forming a loop configuration to confine the slick. (Sinha-OEIS) W73-01830

OIL BARRIER FOR OFFSHORE OIL RIGS, Fre-Del Engineering Corp., Santa Ana, Calif. (as-

signee).

E. C. Greenwood.

U. S. Patent No. 3,592,005, 4 p, 9 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 888, No 2, p 338, July 13, 1971.

Descriptors: "Patents, "Oil spills, Leakage, Oil pollution, "Barriers, "Offshore platforms, Equipment, Pollution abatement, Oil wells, Water quality control, Water pollution control, Water pollution treatment, Water pollution. Identifiers: "Oil leakage.

The barrier is anchored in place in a circular shape around a drilling platform. It consists of steel segments attached to each other by flexible couplings which allow movement in both horizontal and vertical planes. The barrier extends both above and below the water. Inside the barrier, at each joint, a sheet of flexible material seals the joint from interchange of oil or water from one side of the barrier to the other. (Sinha-OEIS)

METHOD OF REMOVING HYDROCARBONS FROM THE SURFACE OF AN AQUEOUS BODY, Phillips Petroleum Co., Bartlesville, Okla. (as-

Phunps Fundaments signee). W. W. Crouch, and C. W. Childers. U. S. Patent No. 3,591,494, 4 p, 5 tab, 3 ref; Offi-cial Gazette of the United States Patent Office, Vol 888, No 1, p 263, July 6, 1971.

Descriptors: "Patents, "Oil pollution, Oil spills,
"Oil wastes, "Pollution abatement, "Polymers,
Water pollution treatment, Water pollution coatrol, Water pollution, Bacteria, Biodegradation,
"Absorption, "Organic compounds.

Floating hydrocarbons are contacted with a fine powdered material consisting essentially of an inti-mate mixture of a water insoluble inorganic filler and a minor amount of a polymer which is com-patible with the hydrocarbons. The resulting ad-mixture absorbs several times as much hydrocar-bon per unit weight as other substances used in

Group 5G-Water Quality Control

this manner. The mixture sinks to the bottom and the hydrocarbons are not expected to be released for extended periods of time. Bacteria may be in-cluded to accelerate biodegradation of the hydrocarbons after they have been carried to the bottom by the polymer-filler mixture. (Sinha-OEIS) W73-01852

PORT FACILITY SHIP SEWAGE COLLEC-TION, TRANSPORTATION AND DISPOSAL

Underwater Storage, Inc., Washington, D.C. (as-

Signec).
H. G. Quase.
U. S. Patent No. 3,590,887, 4 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 888, No 1, p 127, July 6, 1971.

Descriptors: "Patents, "Ships, "Sewage disposal, Coasts, Harbors, Rivers, Water pollution control, Water pollution, Pollution abatement, Equipment, Water quality control.

A method and apparatus are provided for collecting sewage in collapsible containers while ships are in port, and for submerging and anchoring those containers, for raising and transporting them and finally for emptying them at remote locations. (Sinha-OEIS)

FLOATING OIL CONFINING APPARATUS, Ocean Pollution Control, Inc., Dallas, Tex. (as-

signee). H. J. Fitzgerald, and E. H. Koepf. U. S. Patent No 3,590,584, 4 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 888, No 1, p 53, July 6, 1971.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, *Pollution abatement, *Floats, Water quality control, Water pollution control, Water pollution, Water pollution treatment.

Two generally V-shaped float assemblies are formed of a series of inflated, tubular floats connected end to end. One assembly is positioned a short distance behind the other along the same central axis. An anchor holds the divergent ends of the assemblies in position to windward, while their apices trail leeward so that the oil is driven into the open end of the assemblies and funneled toward their apices. The outer end of one assembly has a depending skirt which extends several feet below the surface with its lower end connected to the inner assembly to prevent the akirt from streaming leeward. The apex of the outer assembly is connected to a sump which trails to the rearward and in which oil is collected for transfer through a flexible line connected to a pump on a nearby barge. (Sinha-ORIS) W73-01856

THE RESPONSE OF REPLANT PRACH TREES TO WEEDICIDE, DAILY IRRIGATION, NITROGEN AND PHOSPHORUS, Department of Agriculture, Fernitree (Victoria). Scoresby Horticultural Research Station. For primary bibliographic entry see Field 03F. W73-01864

EFFECTS OF INCREASING AMOUNTS OF OR-GANIC RESIDUES ON CONTINUOUS CORN: L YIELDS AND SOIL PHYSICAL PROPERTIES, Iowa State Univ., Ames. For primary bibliographic entry see Field 03F. W73-01873

GREAT LAKES BASIN COMMISSION, ANNUAL REPORT, FISCAL YEAR ENDING JUNE 30, 1970. Vater Resources Council, Washington, D.C.

For primary bibliographic entry see Field 06E. W73-01908

CARPENTER AND REMMEL DEVELOPMENTS (DRAFT ENVIRONMENTAL IMPACT STATE-MENT).

Arkansas Power and Light Co., Little Rock. For primary bibliographic entry see Field 08C. W73-01910

DEBRIS REMOVAL, NORTH BRANCH CHICAGO RIVER, ILLINOIS (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Chicago, Ill. For primary bibliographic entry see Field 04A. W73-01913

OHIO RIVER BASIN COMMISSION, ANNUAL REPORT, FISCAL YEAR ENDING JUNE 30,

1971. Water Resources Council, Washington, D.C. For primary bibliographic entry see Field 06E. W73-01916

MAINTENANCE DREDGING NOYO RIVER MAINTENANCE DREDGING NOYO RIVER CHANNEL, NOYO HARBOR, MENDOCINO COUNTY, CALIFORNIA (DRAFT ENVIRON-MENTAL IMPACT STATEMENT).

Army Engineer District, San Francisco, Calif. For primary bibliographic entry see Field 04A. W73-01920

EROSION AND FLOODING IN NORTHEAST OHIO-MORE COSTLY PROOF THAT FEDERAL SHORE PROTECTION LEGISLATION IS NEEDED IMMEDIATELY, House, Washington, D.C. For primary bibliographic entry see Field 06E, W73-01922

RESERVE MINING CO. V. MINNESOTA POL-LUTION CONTROL AGENCY (STATE COURT'S AUTHORITY TO DIRECT AGENCY TO ISSUE A VARIATION TO DISCHARGE REGULATIONS).

200 N.W.2d 142-149 (Minn. 1972).

Descriptors: *Judicial decisions, *Regulation, Peterspiors: "Discharge (Water), Heavy metals, Administrative agencies, Water pollution sources, Industries, Mineral industry, Industrial wastes, Industrial water, Legal aspects, Mineral industrial water, Mineral Identifiers: *Taconite, *Administrative law, Apneal and error.

Plaintiff mining company challenged defendant agency's new pollution control regulations on grounds they were arbitrary and unreasonable. The trial court found for plaintiff and remanded the matter to defendant with instructions to issue a variance. Defendant appealed from that decision. Under earlier regulations the plaintiff had been allowed to discharge water carrying waste tailings into Lake Superior where by means of the 'heavy density current' the waste was carried to and into Lake Superior where by means of the 'heavy density current' the waste was carried to and deposited in an area of the floor of Lake Superior known as the 'great trough'. The new regulations would have severely restricted plaintiff's ability to discharge mine wastes and thereby reduced its operations. The Supreme Court of Minnesota affirmed the finding that the regulations were arbitrary and unreasonable, but it held that the trial court had no statutory power to compel issuance of a variance and was required to remand to defendant for further action. (Nielsen-Florida) UNITED STATES V. BUSHEY AND SONS, INC. (FEDERAL COMMON LAW NUISANCE AS A GROUND FOR FOLLUTION ABATEMENT). For primary bibliographic entry see Field 06E. W73-01926

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UNITED STATES V. BENTON AND CO. (CONTINUING OFFENSES AND PROPER PLEADING UNDER RIVERS AND HARBORS ACT). For primary bibliographic entry see Field 06E. W73-01928

GULF OIL CORP. V. MORTON (SUSPENSION ORDERS PURSUANT TO OUTER CONTINENTAL SHELF LANDS ACT). For primary bibliographic entry see Field 66E. W73-01929

GREAT LAKES BASIN COMMISSION, AN-NUAL REPORT, FISCAL YEAR ENDING JUNE 30, 1971. Water Resources Council, Washington, D.C. For primary bibliographic entry see Field 06E. W73-01930

NEW ENGLAND RIVER BASINS COMMISSION, ANNUAL REPORT, FISCAL YEAR 1971. Water Resources Council, Washington, D.C. For primary bibliographic entry see Field 06E. W73-01931

SEDIMENT CONTROL BILL (S.3910). Senate, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-01935

ANNUAL REPORT OF THE COUNCIL OF EN-VIRONMENTAL QUALITY, Senate, Washington, D.C. For primary bibliographic entry see Field 06G. W73-01936

THE UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT IN STOCKHOLM, SWEDEN (ENFORCEMENT OF LAW PROHIBITING OIL SPILLS), House, Washington, D.C.
For primary bibliographic entry see Field 06G. For primar W73-01937

EPA LAUDS DELAWARE'S ANTI-POLLUTION PROGRAMS, Senate, Washington, D.C. For primary bibliographic entry see Field 06E. W73-01939

AGRICULTURAL POLLUTION PROBLEMS. House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-01940

AN ESSENTIAL NATIONAL PRIORITY: A FULL COMMITMENT AND INVESTMENT NOW IN WATER QUALITY, House, Washington, D.C. For primary bibliographic entry see Field 06E. 372 2024

WALKER DAM IMPOUNDMENT, AQUATIC PLANT CONTROL PROJECT, NEW KENT COUNTY, VIRGINIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.

Available from the National Technical Informa-tion Service as PB-207 771-D, \$3.00 in paper copy,

\$0.95 in microfiche. January 20, 1972. 12 p, 1 illus, 3 photo.

Descriptors: *Virginia, *Environmental effects, *Aquatic weed control, *Herbicides, *Weed control, Rooted aquatic plants, Aquatic life, Aquatic plants, Weeds, Diquat, Plant growth, Regulators, Water storage, Reservoirs, Reservoir storage, Usable storage, Reservoir aliting, Impounded waters, Domestic water, Water management (Applied), Water supply. Identifiers: *Environmental Impact Statements, *New Kent County (Va), *Elodes.

*New Kent County (Va), *Elodea.

The proposed project is designed to control the profuse infestation of Brasilian waterweed Elodea in the Walker Dam Impoundment through chemical treatment with a 50-50 mixture of diquat and potassium endothal. The impoundment is a tidal barrier dam located 30 miles southeast of Richmond, Virginia, on the Chickahominy River. The primary purpose of the reservoir, supplying water for domestic purposes, is now in jeopardy as a result of the reduction in storage capacity from the rapid growth of these waterweeds and their tendency to entrap silt in increasing quantities. Both herbicides to be used in the project are biodegradable and present minimal hazards to human life. However, the reservoir water will be unsuitable for drinking purposes for a one week period after spraying. If the entire reservoir is treated, excluding duck marshes, some minor fisk-hills can be expected as a result of plant decomposition and an accompanying oxygen drawdown. There is the possibility of damage to a tree farm irrigated with the reservoir waters unless spraying is confined to the lower reaches of the lake. Also potential downstream contamination from wave action in the dam may cause damage to fauna and flora. The alternative of flushing the reservoir is not considered feasible. (Beardsley-Florida) W73-01944

NAVAL AIR STATION, LEMOORE, CALIFOR-MA; SEWAGE DISPOSAL FACILITY (LAND ACQUISITION) (FINAL ENVIRONMENTAL IM-PACT STATEMENT). Department of the Navy, Washington, D.C. For primary bibliographic entry see Field 05D. W73-01946

CRUDE OIL AND NATURAL GAS PRODUC-TION IN NAVIGABLE WATERS ALONG THE TEXAS COAST (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.

Available from the National Technical Informa-tion Service as PB-200 390-D, \$3.00 in paper copy, \$0.95 in microfiche. June 4, 1971. 63 p, 2 map.

Descriptors: *Texas, *Environmental effects, *Navigable waters, *Oil pollution, Oil wells, Oil spills, Offshore platforms, Surface waters, Estuaries, Shores, Erosion, Sedimentary basins (Geologic), Fish, Wildlife, Aquatic life, Dredging, Drilling, Turbidity, Marine fish, Marine plants, Recreation, Pipelines, Salinity.

Identifiers: *Environmental Impact Statements, *Gulf oil drilling.

The proposed action is the continuance of drilling permits for the erection of structures necessary for the production of crude oil and natural gas. Because the Texas Gulf Coast is an area of abundant water and water-related resources, continued issuance of such permits will have significant environmental effects. Aside from the economic benefits afforded by the proposed action, favorable environmental impact is limited to the enhancement of certain marine species. Adverse effects include an increased potential of ecological damage caused by oil spills from tankers, faulty pipeline equipment, natural disasters, land subsidence, navigational impedence, high turbidities,

alteration of current patterns, reduction of marine and widdlife habitat, increased effluent discharge, increased estuarine sedimentation, and damage to commercial and aport fisheries. Alternatives to the proposed action include complete abatement of permit issuance, necessitating the timely development of other sources of energy, and selective issuance based on approved standards. The latter alternative would deny permission for operations in certain restricted areas, control dredging and spoiling operations in shallow waters, and could require postponement of operations pending technological advances in pollution. (Bradley-Florida) Florida) W73-01949

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

CORRECTIVE TAXES AND POLLUTION CON-TROL, Boston Univ., Mass. Dept. of Economics.

Boston Clary, and R. Jackson. Nebraska Journal of Economics and Business, Vol 2, No 1, p 3-10, 1972 (Winter), 2 fig. 1 tab.

Descriptors: "Pollution taxes (Charges), "Economic efficiency, "Welfare (Economics), Competition, Monopoly. Identifiers: Market power, "Corrective taxes, Oligopoly, Enforcement costs, Consumers' surplus

A theoretical model is formulated to determine whether a corrective effluent charge has positive or negative welfare effects. Welfare effects are measured using conventional consumers' surplus analysis. The model is used to assess the impact of analysis. The model is used to assess the impact of several factors, including (1) market structure, (2) changes in production techniques or in the factor input mix, (3) enforcement costs, and (4) the elasticity of demand for the industry's product. The use of corrective taxes to control the damage caused by externalities may or may not increase social welfare. If enforcement costs are high, social welfare may actually decrease when effluent charges are imposed. The existence of market power does not significantly impair the desirability of a corrective tax if the cost of controlling the externality is low relative to the damage created by the externality. Under competitive conditions, the case for a corrective tax improves as the elasticity case for a corrective tax improves as the clusterity of demand increases. However, with market imperfections, a corrective tax is relatively less desirable the greater the elasticity of demand when the damage per unit of output is less than the difference between price and marginal cost. (Settle-Wisconsis) W73-01592

EVALUATION OF POTENTIAL BENEFITS OF WEATHER MODIFICATION ON AGRICUL-TURE, PART 1, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 03B. W73-01593

DEEP RESERVOIR THERMAL STRATIFICA-

Auburn Univ., Alabama. Dept. of Mechanical Engineering; and Alabama Power Co., Birmingham. Water and Air Resources Section. For primary bibliographic entry see Field 02H. W73-01625

ECOLOGICAL EVALUATION OF RODENT POPULATIONS IN THE DESERT BIOME OF RAJASTHAN, Central Arid Zone Research Inst., Jodhpur (India).

I. Prakash, R. K. Gupta, A. P. Jain, B. D. Rana, and B. K. Dutta. Mammalia, Vol 35, No 3, p 385-407, September 1971, 4 fig. 20 ref.

Descriptors: Evaluation, "Rodents, "Ecology, "Balance of nature, "Wildlife management, Deserts, Arid lands, Biomes, Environmental effects, Mammals, Ecological distribution, Damages, Burrows, Deterioration. Identifiers: Rajasthan, India.

Inter-relationships between the fauna and flora in the desert are principally dependent on the soil moisture and temperature fluctuations. Both plants and animals are physiologically most active during and soon after the rainy season. Man disturbs the natural environment by changing the habitat pattern through agricultural operations and clearing of the natural eventuation. The frequently disturbed soil conditions play an important role in the dispersal of animals, particularly of the fossorial ones. The situation is further aggravated by the presence of large numbers of livestock, much in excess of the carrying capacity of the land, resulting in severe overgrazing and its associated problems of soil compaction, reduced infiltration, increased run-off and loss of soil. All these factors exert modifying influences on the inter-relation-ships between soil, water, plants and animals. The relationships between rodent populations, vegetation composition, and soil types in the desert biome of Rajasthan, India were investigated. Studies on the vegetation were conducted and rodents were trapped at eleven localities in different habitats. A total of 449 rodents were collected. They represented 14 species and sub-species belonging to the families Sciuridae, Muridae, and Gerbillinae. None of the recorded rodent species was found to be associated with a particular plant community. However, a broad association between rodent species, vegetation type and soil type was determined. Relative abundance, trap index, and habitat preference of the rodents are discussed. (Black-Arizona)

MANAGEMENT SCIENCE AND GAMING IN WASTE MANAGEMENT, IBM Cambridge Scientific Center, Mass. For primary bibliographic entry see Field 05G. W73-01775

WATER RESOURCES PLANNING TO SATISFY WALER RESUURCES PLANNING TO SATISFY GROWING DEMAND IN AN URBANIZING AGRICULTURAL REGION, Utah State Univ., Logan. Coll. of Engineering. For primary bibliographic entry see Field 06D. W73-01776

ESTIMATING COSTS OF EARTHWORK VIA SIMULATION,
Pennsylvania State Univ., University Park.
J. H. Willenbrock. Journal of the Construction Division, American Society of Civil Engineers, Vol 98, No CO1, p 49-60, March 1972. 4 fig, 2 tab, 7 ref, 3 append.

Descriptors: *Estimated costs, *Simulation, *Computer models, Construction, Management, Computers, Estimating, Planning, Bids, Project planning, Construction equipment, Computer programs, Earth handling equipment, Excavation, Queueing theory.

[dentifiers: *Earth moving, Selection, Alternatives, GPSS (Programming language), Earthfill, Loaders.

To establish an estimated unit price for the earthmoving phase of a project, selection of the equipment fleet and the management policy governing usage must be made. The productivity consequences associated with each alternative must be known to make a rational selection from

Field 06-WATER RESOURCES PLANNING

Group 6A-Techniques of Planning

available alternatives. Computer simulation of an earthmoving operation, using the General Purpose Simulation System (GPSS) programming language, is presented. An example is analyzed to illustrate the technique for determining productivity consequences using computer simulation. The computer simulation technique is a powerful management tool, which undoubtedly will assume greater significance in estimating and planning future projects, (USBR) W73-01789

A NOTE ON ECONOMIC GROWTH AND EN-VIRONMENTAL QUALITY, Australian National Univ., Canberra. For primary bibliographic entry see Field 05G. W73-01809

ON MODELS OF COMMERCIAL FISHING: A DEFENSE OF THE TRADITIONAL LITERA-

TORM, Department of Commerce, Washington, D.C. R. F. Fullenbaum, E. W. Carlson, and F. W. Bell. Journal of Political Economy, Vol 80, No 4, p 761-768, July-August 1972. 2 fig, 7 ref.

Descriptors: *Fisheries, *Commercial fishing, *Mathematical models, Economics, Stability, Phase diagrams, Biomass, Equilibrium, Fishing, Identifiers: *Fishery models, *Received theory.

Identifiers: "Fishery models, "Received theory."

In 1969, Vernon L. Smith advanced a general model incorporating the theory of the firm with the traditional economic theory of commercial fishing. The results of Smith's model seemingly upset much of the traditional theory regarding fishery policy. Smith makes a number of assumptions which, when combined with the basic structure of his model, lead to results which are intuitively implausible and dynamically inconsistent. Specific shortcomings of Smith's model are that it (1) derives a positive relationship between the stock of capital and the equilibrium biomass in a given range in its most general form, (2) obfuscates the relationship between the capital stock and the factor inputs, (3) introduces possible pecuniary externalities where none are hypothesized, (4) varies the size of the firm in a explicitly long-run theory, and (5) presents dynamically unstable solutions under simplifying assumptions. On the other hand, the traditional theory abstracts from variations in firm size, allows long-run changes in output only through changing the level of homogeneous operating units, gives unambiguous results with respect to the impact of fishing effort upon the biomass, and can internalize externalities without creating dynamically unstable outcomes. (Settle-Wisconsia) W73-01810 Wisconsin W73-01810

DYNAMIC ASPECTS ON THE USE OF PRICES FOR PROTECTING THE ENVIRONMENT, Stockholm Univ. (Sweden). For primary bibliographic entry see Field 05G. W73-01811.

POLICY PRESCRIPTIONS IN BIONOMIC MODELS: THE CASE OF THE FISHERY, British Columbia Univ., Vancouver. Journal of Political Economy, Vol 80, No 4, p 769-775, July-August 1972. 3 fig, 6 ref.

Descriptors: *Mathematical models, *Sustained yield, Biomass, Economic efficiency, Fisheries. Identifiers: *Fishery models, *Bionomic models, Sustainable levels.

The general form of the fishery model is a system of two differential equations, one referring to the biotechnical characteristics of the fishery and the other to the economic behavior of the fishing fleet. Within the framework of this model, it is shown

that economic efficiency may involve a permanent increase in the total expenditure on factors employed in the fishery. Uncontrolled and excessive entry certainly may drastically reduce fish populations and hence sustainable levels of effort. However, with regulation, after an initial reduction in effort and catches in order to build up stocks, it is possible to rebuild population and thus sustain larger fleets. If the model's biological mechanism is altered so that the biomass in any one year is solely a function of the survival rate in the previous year, then economic efficiency may require reductions in the sustainable biomass. In the world of fisheries, salmon provide a striking example of such a "regenerative model". The unexploited salmon population is not always the largest, since excessive escapement or insufficient catch may seriously overcrowd the spawning grounds. Thus, free-access exploitation may be associated with excessive catches and biomass. (Settle-Wisconsin) W73-01812

6B. Evaluation Process

GROUNDWATER-AN IMPERATIVE IN WATER RESOURCES PLANNING, National Water Well Association, Columbus, For primary bibliographic entry see Field 04B. W73-01337

LESS RHETORIC NEEDED, Bureau of Domestic Commerce, Washingto D.C. Office of Business Research and Analysis. For primary bibliographic entry see Field 06C. W73-01588

THE VALUE OF IRRIGATION WATER, Monash Univ., Clayton (Australia). C. Clark. Economic Analysis and Policy, Vol 2, No 2, p 14-18, September 1971.

Descriptors: "Irrigation water, "Irrigable land, "Cost-benefit analysis, "Value, "Economic efficiency, Profit, Water supply, Water utilization, Welfare (Economics).
Identifiers: "Irrigation agriculture, "Urban water

use, "Australia.

There are several ways of measuring the value of water for the irrigation of crops. The first method is simply to take the gross value of the expected crops on irrigated land. However, this method of valuation assumes that all factor inputs have no real cost and no alternative use. Thus, this approach is clearly erroneous, and substantially over-values irrigation water. A second method deducts real factor costs from gross revenues, and thus provides a more realistic valuation of irrigation water. A third method of valuing water input is by programming. This is a complex process by which all the possible alternatives open to the farmer are mathematically analyzed. The final programme indicates the various product combinations which maximize the farmer's net return. The last two methods for valuing irrigation water suggest that Australia should not continue to give priority to irrigation agriculture. Since Australia still has huge reserves of good rainfall land unused, urban water supplies should enjoy priority. While small-acale, privately organized irrigation may be remunerative on certain high-valued crops, the construction of large-scale dams for irrigation is unremunerative in Australia. (Settle-Wisconsin) W73-01591

EVALUATION OF POTENTIAL BENEFITS OF WEATHER MODIFICATION ON AGRICUL-TURE, PART 1, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 03B. W73-01593

ENGINEERING FOR ECOLOGICAL, SOCIOLOGICAL, AND ECONOMIC COMPATI-

SOCIOLOGICAL, AND ECONOMIC COMPATI-BILITY,
Michigan State Univ., East Lansing. Dept. of Electrical Engineering and Systems Science; Michigan State Univ., East Lansing. Dept. of Zoology; and Michigan State Univ., East Lansing. Dept. of Economics.
H. E. Koenig, W. E. Cooper, and J. M. Falvey.
Institute of Electrical and Electronic Engineers Transactions on Systems, Man, and Cybernetics, Vol SMC-2, No 3, p 319-331, July 1972. 1 fig, 6 ref.

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Descriptors: "Environmental effects, "Pollution abatement, Control, Regulation, Prices. Identifiers: "Market failure, "Environmental deterioration, "Material balance, "Energy balance, "Compatibility, Pollution control, Policy.

balance, *Compatibility, Pollution control, Policy.

Industrial societies have evolved under the influence of an incentive system and a technological revolution that treats the environment as infinite in its waste absorbing capabilities, if not in resource producing capabilities, is swell. Consequences of the failure to recognize the laws of material and energy balance is our present environmental crisis. To avoid further environmental deterioration, man must engineer the developments of industry, agriculture, and human habitats so that explicit consideration is given to environmental impacts. Specifically, a solution to the environmental problems requires developing the capability to (1) assess the material and energy processing capacities of major components of the natural environment, (2) manipulate the ecological communities of certain portions of the natural environment to increase the mass-energy assimilation capacity, (3) structure the features of economic sectors so as too retain ecological compatibility, and (4) design and implement comprehensive economic and social instruments of control. Viewed as a two-stage process, we need first to choose among the feasibel alternative ecosystems, and then determine how to structure pricing mechanisms, regulating policies, and other social instruments to direct landscape development toward the chosen goal. (Settle-Wisconsin)

RESIDUALS CHARGES FOR POLLUTION CONTROL: A POLICY EVALUATION, Bowdoin Coll., Brunswick, Maine. Dept of Economics; and Wisconsin Univ., Madison. Dept. of Economics. of Economics.
A. M. Freeman, III, and R. H. Haveman.
Science, Vol 177, No 4046, p 322-329, July 28,

Descriptors: *Pollution abatement, *Pollution taxes (Charges), *Regulation, *Evaluation, Administration, Measurement, Prices, Economic efficiency.
Identifiers: *Enforcement, *Residuals charge.

Identifiers: *Enforcement, *Residuals charge.

The residuals charge and regulation-enforcement strategies for pollution control are compared. The residuals charge strategy attempts to bring degradable environmental resources inside the scope of the market system. The regulation-enforcement strategy consists of establishing ambient air and water quality standards and using the state's police power to attain these standards. As presently constituted, both approaches require the establishment of some standard. However, the regulation-enforcement system awards pollution permits to dischargers free of charge, while the residuals charge approach requires the polluter to pay for each unit of waste. Both approaches require the measurement of discharges. In the costs of waste reduction, the regulation-enforcement system can achieve a quality standard, but at a total cost which is likely to be substantially above the minimum attainable. Under similar circumstances, the residuals charge system would achieve pollution reduction at minimum costs. A residuals charge approach is an administratively

simple strategy avoiding many of the pitfalls of the regulation-enforcement approach. Several frequently uttered criticisms of an effluent charge system are considered and dismissed. Consequently, a charges system is seen to be more effective and efficient than a regulation system. (Settle-Wisconsin)

THE LIVE BAIT INDUSTRY IN OHIO: ITS EX-TENT, CONDITION AND PROBLEMS, Ohio State Univ., Columbus. Natural Resources J. M. Pie

J. M. Pierce.

Available from the National Technical Information Service as COM-72-10057, 33.00 in paper
copy, 30.95 in microfiche. Ohio State Dept. of
Natural Resources Contract under the Commer
cial Fisheries Research and Development Act,
Completion Report, 1971. 65 p, 18 tab, 4 append.

Descriptors: *Baits, *Supply, *Demand, Ohio, *Bait fishing, Income.
Identifiers: *Live bait, Retail sales, Wholesale sales, Propagation.

The general magnitude, importance, and condition of Ohio's live bait industry was assessed in 1970-1971 through questionnaires and interviews. Results showed that the adjusted dollar value of retail bait sales in Ohio in 1969 approximated \$4,283,096. The bulk of these sales occurred in the retail bait sales in Olno in 1969 approximated \$4,283,096. The bulk of these sales occurred in the nightcrawler-crappie-minnow categories, which approached \$3,310,042 in annual sales. The most popular winter baits were maggots, waxworms, bee larvae, and minnows. Average gross retail live buit sales in Ohio were generally low, with partime dealers reporting an average gross of \$1,380 and full-time dealers an average of \$4,516 in sales. Ohio's wholesale live bait industry consists of one or two large dealers and thirty or forty relatively small dealers. The total dollar volume of 24 reporting wholesale bait suppliers was \$889,968 in 1969. The third segment of Ohio's bait industry, the bait propagators, had a projected total bait sales of \$118,409 in 1969. The bulk of the propagated bait quantities occurs in the fishworm and waxworm categories. The survey of fishermen indicated that bait industries' failures included excessive prices, scarcity of certain popular baits, and poor store locations. The survey data is presented in numerous tables. (Settle-Wisconsin) W73-01597

THE IMPACT OF COSTS ASSOCIATED WITH NEW ENVIRONMENTAL STANDARDS UPON THE PETROLEUM REFINING INDUSTRY. Sobotka (Stephen) and Co., New York.

Available from the National Technical Informa-tion Service as PB-207 197, PB-207 198, PB-207 199, each, \$3.00 in paper copy, \$0.95 in microfiche. Prepared for the Council on Environmental Quali-ty, November 23, 1971. 133 p, 3 parts.

Descriptors: "Pollutants, "Pollution abatement, "Economic impact, "Economic efficiency, "Costs, Water pollution, Air pollution, Standards, Profit, Prices, Demand. Identifiers: "Petroleum refinery industry.

The economic impact of pollution abatement costs arising from the regulation of petroleum refinery airborne and waterborne emissions is studied. Utilizing the EPA's cost estimate, the study concluded that (1) refined product prices at the refinery gate will increase about 8 cents per barrel of 0.2 cents per barrel of refinery gate will increase about 8 cents per barrel or 0.2 cents per gallon, (2) the earning power of the industry as a whole will be unimpaired, (3) there may be a minor acceleration in the rate at which very small refineries close, (4) fewer than 1,000 people out of a total employment of 150,000 may be displaced, (5) the industry's cost for installing control equipment in new facilities will be about \$113 million, and (6) refineries below about 25,000 barrels per day capacity, and especially those below about 10,000 barrels, face control costs quite large relative to their going concern value. This study failed to account for a number of major changes likely to occur, including federal requirements for making lead-free gasoline available, restriction of lead content in leaded gasoline, higher average sulfur content in crude oil supplies, and higher market demand for sulfur-free residual oil. (Settle-Wisconsin)

THE ECONOMIC IMPACT OF POLLUTION CONTROL, A SUMMARY OF RECENT STUDIES, AN OVERVIEW.

Chase Econometric Associates, Inc., Philadelphia,

Prepared for the Council on Environmental Quali-ty, the Dept. of Commerce, and the Environmen-tal Protection Agency. 41 p, 1 tab, 1 append. 1971.

Descriptors: *Pollution abatement, *Standards, *Regulation, *Economic impact, Industries, Costs, Economic efficiency. Microeconomic Identifiers: effects

One macroeconomic and eleven microeconomic studies are reviewed in order to assess the economic impacts of air and water pollution abatement requirements. The macroeconomic subject of a computer-based econometric model to determine the impact of pollution abatement costs on such macroeconomic variables as growth of GNP, inflation, unemployment, interest rates, and balances of trade and payments. The microeconomic studies concentrated on such variables as sales, prices, profits, plant closings, employment, and community impacts in the industries studied, which included automobiles, baking, cement, electric power generators, fruit and rices studied, which included automobiles, baking, cement, electric power generators, fruit and vegetable canning and freezing, iron foundries, leather tanning, nonferrous metals smelting and refining, petroleum refineries, pulp and paper mills, and steel making. The macroeconomic study indicated that the national economy will not be severely impacted by the imposition of pollution abatement standards. This conclusion is supported by the microeconomic studies, which indicated that pollution control costs would not be so severe as to seriously threaten the long-run economic viability of the industrial activities examined. An appendix contains a brief discussion of each of the eleven microeconomic studies. (Settle-Wisconsin) W73-01599

ECONOMIC IMPACT OF ENVIRONMENTAL CONTROLS ON THE FRUIT AND VEGETABLE CANNING AND FREEZING INDUSTRIES. Dunlap and Associates, Inc., Manhattan, Kans. Agri Div.

Available from the National Technical Informa-tion Service as PB-207 140, PB-207 141, PB-207 142, PB-207 143, each \$3.00 in paper copy, \$0.95 in microfiche. Prepared for the Council on Environ-mental Quality, November, 1971. 441 p, 4 parts, 22 tab, 19 exhibits, 35 ref.

Descriptors: *Pollution abatement, *Regulation, *Economic impact, Standards, *Costs, Employment, Income, Profit, Prices, Economic efficien-

The economic impact of environmental controls on the fruit and vegetable processing industry is analyzed in terms of costs, capital requirements, profits, industry structure and location, employment, product prices, and regional and national economic impacts. A study of the industry's structure and an application of impact analysis suggests that future pollution abatement regulations will have a very serious impact on the industry. Unless some lower cost pollution abatement alternative

such as municipal treatment can be found, the smaller third and to some extent the middle third of the plants will be seriously impacted. Most likely, these smaller plants will not be able to recover the cost of installing and operating the secessary abatement facilities, and thus will be forced to shut down. Little impact, however, will be felt by the consumer since the overall expected price increase will be only 1.4 to 2.3 percent. Unfortunately, many processing plants are located in areas already economically depressed. Consequently, the potential impact of dislocations may be borne disproportionately by the nation's poorer areas. Various other economic impacts are also assessed. Numerous statistical evidence is provided, including a 126-page statistical supplement. (Settle-Wisconsin) sin) W73-01600

ENVIRONMENT AND DEVELOPMENT, THE

ENVIRONMENT AND DEVELOPMENT, THE FOUNEX REPORT.

Available from Carnegie Endowment for International Peace, New York, N.Y. via Taplinger Publishing Co., Inc. 200 Park Ave., N.Y. for \$1.00. Panel of Experts Convened by the Secretary-General of the United Nations Conference on the Human Environment, June 4-12, 1972. Founex, Switzerland, International Conciliation, Report No 586, January, 1972. 84 p, 3 tab.

Descriptors: *Pollutants, *Environmental effects, *Economic impacts, Pollution abatement, Costbenefit analysis, Planning. Identifiers: *Economic growth, *Less-developed countries, Economic development.

The objective of this Report (p 7-36) is to place the growing environmental concern in its proper developmental perspective and in the context of the urgent and pressing needs of developing countries. The major environmental problems of developing countries are essentially problems that reflect poverty and lack of economic development. Thus, in large measure the kind of environmental problems that are of importance in developing countries are those that can be overcome by the process of development itself. However, development has, on occasion, been responsible for adverse environmental side effects such as resource deterioration, biological pollution, chemical pollution, physical disruption, and social disruption. Consequently, development planners should recognize the detrimental potentialities of the development process and endeavor to avoid, or at least minimize, them. The minimization of adverse side effects might be achieved through a combination of (1) minimum environmental standards, (2) aggregative and sectoral environmental policies, and (3) careful assessments of the micro impact of development projects. Twenty-five policy oriented recommendations are offered in the areas of development strategy, project appraisal, research and study, institutional requirements, information and education, trade and aid, and international action. (See also W73-01602 thru W73-01601

THE CONFRONTATION BETWEEN
PROBLEMS OF DEVELOPMENT AND ENVIRONMENT,
Minister of Foreign Affairs, Rio de Janeiro
(Brazil). Special Adviser.
M. A. Ozorio de Almeida.
International Conciliation, No 586, p 37-56, January, 1972. 3 tab.

Descriptors: *Pollutants, *Environmental effects, *Economic impact, Water pollution, Air pollution, Planning.
Identifiers: *Economic development, Less developed countries.

What makes international cooperation in the en-vironment field necessary for all countries is the

Field 06-WATER RESOURCES PLANNING

Group 6B—Evaluation Process

fact that a type of pollution of worldwide sig-nificance is occuring at an accelerating rate. The major pollutants of land, air, and sea that have been identified as having international significance include carbon dioxide, carbon monoxide, sulphur dioxide, nitrogen oxides, phosphates, mercury, lead, oil, persistent organochlorine insecticides such as DDT, and radionuclides. In addition, to these major pollutants, there are others whose ef-fect is either more localized or not so well un-derstood. Among these other pollutants are certain metals used in industry, such as cadmium in the metallurgical and paint industry, other organic compounds, particles originating in different man-made or natural processes, heat, noise, and an-tibiotics. Although most, if not all, of these pollu-tants originate in industrialized countries, the tants originate in industrialized countries, they may have serious implications for developing countries. Even if the developing countries escape being polluted by the developed nations, the process of development itself may create unwanted pollutants. To mainmize the environmental impact of development, countries need to encourage more research in critical areas, provide for a better dissemination of environmental knowledge, and work to prevent the unnecessary loss of unrecoverable resources. (See also W73-01601). (Settle-Wisconsin)

ECONOMIC DEVELOPMENT AND THE EN-VIRONMENT: A FALSE DILEMMA, London Univ., (England); and University Coll., London (England). Dept. of Political Economy.

International Conciliation, No 586, p 57-71, Janua-

Descriptors: *Environmental effects, *Pollution abatement, *Economic impact, Water pollution, Air pollution, directive section (dentifiers: *Economic development, *Economic growth, Less developed countries.

Contrary to the claims of some of the more ex-Contrary to the claims of some of the more ex-treme conservationists, economic growth is not synonymous with a reduction in social welfare. For example, over the past decade there has been a general improvement in the state of the rivers in Britain, and in some cases this improvement has been dramatic. Britain's experience with cleaning up air and water pollution demonstrates clearly that we are not in the grip of some immutable technical relationship between national product and pollution. Consequently, developing countries need not completely sacrifice their environment for economic growth. Of course, depending on for economic growth. Of course, depending on their relative preferences for economic growth and their relative preterences for economic growth and the environment, countries will choose different growth rates and pollution levels. Ideally, coun-ries would choose the growth rate which just equates the net benefits of faster growth with the costs of environmental deterioration. Countries costs of environmental deterioration. Countries that have some natural for technical advantage for handling pollutants should produce those goods most responsible for pollution. Such specialization merely follows the 'laws of comparative advantage.' Finally, the specter of resource exhaustion should not deter development, because as scarce resources become more and more expensive new technologies will be developed and new substitutes discovered. (See also W73-01601). (Set-tle-Wisconsin) tle-Wisconsin) W73-01603

ENVIRONMENTAL CONCERN DEVELOPMENT PLANNING. AND Ecole Pratique des Hautes Etudes, Paris, International Conciliations, No 586, p 72-77, January, 1972.

Descriptors: *Pollution abatement, *Economic impact, *Environmental effects, Planning, Income,

Identifiers: *Economic development, Less developed countries.

The disruptive ecological effects of many irriga-tion projects, mines, and other major investment projects in developing countries have proved so great that the projects have become virtually self-defeating. These failures arose because (1) the ecological impact of a project failed to be identified, (2) officials were interested in minimiz-ing the apparent capital-output ratio, or (3) techni-cal measures for environmental quality control were proposed and carried out with total disregard for the opinions of the population concerned. Remedial action in such cases should be a relative-ly simple matter since many environmental profor the Opinions of the population concerned.

Remedial action in such cases should be a relatively simple matter since many environmental projects such as water control, soil management, and afforestation can be implemented by relatively labor-intensive methods. This would harmonize environmental concerns with the employment goals that are so important in development planning. Development planners can further reduce the environmental impact of industrialization by (1) utilizing less polluting technologies, (2) emphasizing the recycling of wastes, (3) locating industries appropriately, (4) supporting more environmentally compatible income distributions, and (5) encouraging certain types of collective comsumption. However, developing countries should refuse development patterns in which expenditures on remedial environmental action require an ever-increasing share of GNP. (See also W73-01601). (Settle-Wisconsin) W73-01604

DEVELOPMENT STRATEGY AND THE EN-VIRONMENT ISSUE, Central Bank of Ceylon, Colombo. Deputy Gover-

International Conciliation, No 586, p 78-83, Janua-

Descriptors: *Environmental effects, *Economic efficiency, *Planning, Evaluation, Costs, Benefits, Cost-benefit analysis. Identifiers: *Economic development, *Less developed countries, Economic growth, Industrialization

The environmental problems of the developing countries are largely a reflection of their lack of development. These environmental problems confronting poor societies include poor water supplies, inadequate sanitation and sewage facilities, poor housing, sickness and disease, and vulnerability to natural disasters. Development is, to a large extent, a cure for these problems. Consequently, the developed countries' concern for the environment must not take the form of arguments that suggest that poor societies should reduce their economic growth rates in the name of environmental conservation. Undoubtedly, as poor societies become more developed they will begin to experience the same environmental deterioration as the industrial countries. Nevertheless, the cost of a certain amount of environmental less, the cost of a certain amount of environmental deterioration will be worth bearing in order to enjoy the benefits associated with development. Hopefully, the developing countries will learn from the mistakes of the industrialized nations. from the mistakes of the industrialized nations, and reflect an awareness of environmental problems in their development plans. However, the planning emphasis must fall on the social environment and on the environmental problems of relevance to everyday living in the poor societies, rather than on problems that are pertinent only to more advanced stages of development. (See also W73-01601). (Settle-Wisconsin)

FISHERIES MANAGEMENT IN PERU, Universidad Nacional de Trujillo (Peru).

A. Guerra. Marine Pollu March 1972. Pollution Bulletin, Vol 3, No 3, p 39-40, Descriptors: Fish, *Fisheries management, Waste disposal, Management.
Identifiers: *Peru, Fishery development.

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OHIO REP 1971.

Identifiers: *Peru, Fishery development.

Off the Peruvian coast lies an enormous fishery which was never exploited until 1939 and thereafter. Peruvian offshore waters contain more than 600 known species of fish, of which 26 are commercially exploited. Important fresh water fish include crayfish in the coastal parts of rivers and trout and shad in highland rivers and lakes. Marine mammals include whalebone and toothed whales and sea lions. Peru is now the world's largest producer of fish meal. In 1959, only one fish processing plant existed; in 1967 there were 220 plants employing about 14,000 people. The Peruvian fishing industry is comprised of canning, freezing, salting, and fish meal production, the latter processing the anchovy, with some menhaden, about 10 million tons being caught anaually. A number of governmental agencies exist to improve the exploitation of, and regulate, the fishery. Among the principal problems of the fishery are lack of a plan to avoid depletion of any species; need for improved fishing vessels, ports, and manufacturing processes; and existence of a public which is basically uniformed as to food fish. Pollution is not yet a Peruvian fishery problem. (McEntyre-PAI)

THE ECONOMICS OF ENVIRONMENTAL PRESERVATION: A THEORETICAL AND EMPIRICAL ANALYSIS, Resources for the Future, Inc., Washington, D.C. Natural Environments Program. For primary bibliographic entry see Field 06G. W73-01772

MANAGEMENT SCIENCE AND GAMING WASTE MANAGEMENT, IBM Cambridge Scientific Center, Mass. For primary bibliographic entry see Field 05G. W73-01775 MANAGEMENT SCIENCE AND GAMING IN

THE ECONOMIC PERFORMANCE OF PUBLIC INVESTMENTS, AN EX POST EVALUATION OF WATER RESOURCES INVESTMENTS, Wisconsin Univ., Madison. Dept. of Economics.

Published for Resources for the Puture, Inc. by The John Hopkins Press, Baltimore, Maryland, and London, England. 1972. 126 p, 31 fig, 21 tab, 3

Descriptors: "Water resources development, "Cost-benefit analysis, "Evaluation, "Estimated costs, "Estimated benefits, Costs, Benefits, Economic efficiency, Identifiers: "Evaluation bias, Ex ante evaluation, Ex post evaluation, Public investments.

Ex post evaluation, Public investments.

A conceptual framework for the ex post appraisal of the economic performance of public sector investments is developed, and a 'first cut' at estimating some of the realized effects of public works investments in the water resources field is attempted. The framework involves (1) re-evaluating the ex ante expected efficiency benefits of a project by using current evaluation methodology but data from the time of project construction, (2) appraising the performance of the project from the date of project completion to the present, and (3) comparing the realized performance with the re-evaluated prediction. In the empirical case studies presented, ex post estimates of benefits often showed little relationship to their ex ante counterparts, indicating the possibility of a serious bias incorporated into agency ex ante procedures which results in persistent overstatement of expected benefits. Similarly, enormous variance was found between estimated and realized costs. In the agregate, however, no persistent bias was evident. This study demonstrates the need to seriously reappraise the procedures of benefit-cost analysis

as practiced by government agencies. (Settle-Wisconsin) Wisconsin) W73-01792

AN ECONOMIC PERSPECTIVE, Rhode Island Univ., Kingston. For primary bibliographic entry see Field 06C. W73-01801

SCIENCE, TECHNOLOGY, AND DEVELOP-MENT, VOLUME IV, INDUSTRIAL DEVELOP-MENT.

mary bibliographic entry see Field 03E.

INTEGRATED RIVER-BASIN DEVELOPMENT AND INDUSTRIALIZATION: THE TENNESSEE VALLEY EXPERIENCE, Indiana Univ., Bloomington. International Busi-

For primary bibliographic entry see Field 03E. W73-01805

SOCIOECONOMICS OF MULTIPLE USES, Stone (Ralph) and Co., Inc., Los Angeles, Calif. R. Stone, and H. Friedland. Journal of the American Water Works Associa-tion, Vol 64, No 6, p 351-353, June 1972. 1 tab.

Descriptors: "Reservoirs, "Water supply, "Multi-ple-purpose reservoirs, "Recreational facilities, Recreation demand, Potable water, Water treat-ment, Mathematical models, Cost-benefit analy-sis, "California.

Many water authorities believe that with adequate treatment and protective regulations, water supply reservoirs can accommodate varying degrees of recreational use with little or no loss in water quality and safety. This hypothesis was tested by examining four California reservoirs which provide for varying degrees of recreational use. Both published and unpublished data were obtained concerning the four reservoirs' physical and climatological characteristics, water quality and usage, service populations, capital costs, and operating income and expenditures. The following two-part analysis was made of each reservoir's economic contribution to the surrounding community: (1) a comparative land-value study of statistically similar study areas to determine the effects of view and proximity to the recreational-use reservoir; and (2) a cost-benefit evaluation of the economic impact of recreational reservoir usage. The study's results suggest that recreational use of a reservoir can be compatible with providing safe, high-quality potable water for the domestic user under the following conditions: good reservoir planning-management, and complete or appropriate treatment of the water after recreational use and prior to distribution to the water consumer. (Settle-Wisconsin) Many water authorities believe that with adequate

WATER AND RELATED LAND RESOURCES MANAGEMENT. THE CHALLENGE AHEAD. Water Resources Council, Washington, D.C. For primary bibliographic entry see Field 06E. W73-01814

OHIO RIVER BASIN COMMISSION, ANNUAL REPORT, FISCAL YEAR ENDING JUNE 30,

1971. Water Resources Council, Washington, D.C. For primary bibliographic entry see Field 06E. W73-01916

GREAT LAKES BASIN COMMISSION, ANNUAL REPORT, FISCAL YEAR ENDING JUNE 30, 1971. Water Resources Council, Washington, D.C.

For primary bibliographic entry see Field 06E. W73-01930

NEW ENGLAND RIVER BASINS COMMIS-SION, ANNUAL REPORT, FISCAL YEAR 1971. Water Resources Council, Washington, D.C. For primary bibliographic entry see Field 06E. W73-01931

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

LESS RHETORIC NEEDED, Bureau of Domestic Commerce, Washington, D.C. Office of Business Research and Analysis. K. L. Kollar, and R. Brewer. Water and Wastes Engineering, Vol 9, No 7, p D1-2, 12, July 1972, 5 tab.

Descriptors: *Water pollution control, *Treatment facilities, *Equipment, *Construction costs, Pollution abatement, Costs, Legislation. Identifiers: *Secondary treatment.

Between 1971 and 1980, expenditures on water Between 1971 and 1980, expenditures on water pollution control equipment and water treatment facilities should be at least \$47.5 billion. Of this total, \$41.8 billion will go for construction and \$5.7 billion for control equipment. These estimates are based on meeting goals of secondary treatment and can be considered conservative if stricter legislation is enacted. These expenditures should eliminate the backlog of 35 percent of our population which has either no collection system or a collection system with primary or no treatment. Conlection system with primary or no treatment. Consequently, 65 percent of the estimated \$4.7.5 billion will be allocated to municipalities. The remaining \$14.5 billion will be spent by the 9,400 plants which \$14.5 billion will be spent by the 9,400 plants which accounted for more than 97 percent of all the water used in manufacturing, 46 percent of value added, and 30 percent of employment. At 1971 output levels, these plants need to spend approximately \$6.4 billion to provide secondary treatment. Another \$8.1 billion will be required to cover increases in water use between 1971 and 1980 and to reduce thermal pollution to acceptable levels. (Settle-Wisconsin) tle-Wisconsin) W73-01588

THE VALUE OF IRRIGATION WATER, Monash Univ., Clayton (Australia).
For primary bibliographic entry see Field 06B.
W73-01591

CORRECTIVE TAXES AND POLLUTION CON-

TROL, Boston Univ., Mass. Dept. of Economics. For primary bibliographic entry see Field 06A. W73-01592

ENGINEERING FOR ECOLOGICAL, SOCIOLOGICAL, AND ECONOMIC COMPATI-SOCIOLOGICAL, AND ECONOMIC COMPATI-BILITY,
Michigan State Univ., East Lansing. Dept. of
Electrical Engineering and Systems Science;
Michigan State Univ., East Lansing. Dept. of
Zoology; and Michigan State Univ., East Lansing.
Dept. of Economics.
For primary bibliographic entry see Field 06B.
W73-01595

RESIDUALS CHARGES FOR POLLUTION CONTROL: A POLICY EVALUATION, Bowdoin Coll., Brunswick, Maine. Dept of Economics; and Wisconsin Univ., Madison. Dept. of Economics. For primary bibliographic entry see Field 06B.

THE LIVE BAIT INDUSTRY IN OHIO: ITS EX-TENT, CONDITION AND PROBLEMS, Ohio State Univ., Columbus. Natural Resources For primary bibliographic entry see Pield 06B. W73-01597

THE ECONOMIC VALUE OF WATER QUALI-TY. Metcalf and Eddy, Inc., Palo Alto, Calif. For primary bibliographic entry see Field 05F. For primar W73-01679

ECONOMICS OF ION EXCHANGE TECHNOLOGY APPLIED TO MUNICIPAL WATER QUALITY IMPROVEMENT, Bresler and Associates, Inc., New York. For primary bibliographic entry see Field 03A. W73-01680

HOW TO MAKE A PROFIT ON WASTE HEAT, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 05G. W73-01716

THE ECONOMIC PERFORMANCE OF PUBLIC INVESTMENTS, AN EX POST EVALUATION OF WATER RESOURCES INVESTMENTS, Wisconsin Univ., Madison. Dept. of Economics. For primary bibliographic entry see Field 06B. W73-01792

ECONOMIC DAMAGE CAUSED BY AQUATIC WEEDS, PRELIMINARY SURVEY.
Agency for International Development, Washington, D.C. Office of Science and Technology.
For primary bibliographic entry see Field 04A.
W73-01794

THE ECONOMICS OF DISPOSAL POLLUTION AND RECYCLING, For primary bibliographic entry see Field 05G. W73-01795

WILL ECOLOGY KILL SMALL BUSINESS, McConkey (Dale D.) Associates, Norwood, Mass. D. D. McConkey. Business Horizons, Vol 15, No 2, p 61-69, April

Descriptors: *Pollution abatement, *Regulation, *Economic impact, *Social impact, Costs, Benefits, Competition, Ecology.
Identifiers: *Small businesses, *Government

assistance.

Ecological concerns have created pressing problems for small business. Compared to large businesses, small firms are less influential, less flexible, and do not have the budgets that permit them to enjoy the advantages of long-range planning or internal expertise. Consequently, the cost of abding by new environmental regulations may be more than many small firms can bear unless they receive help in meeting the ecology issue. Such assistance could take any of several forms. In certain instances, research efforts may suggest methods of converting wastes into desirable byproducts. Government assistance may be necessary for some small businesses. Assistance could take such forms as accelerated depreciation; long-term, low-interest loans; relocation allowances; technical assistance; and partial subsidies. Some small firms may be able to switch to new or changed products which have a smaller environmental impact. Small firms located in the same area might explore the possibility of combining efforts when attacking the ecology problem. In some instances, the small firm should be encouraged to merge with a larger, more flexible firm. Other

Field 06—WATER RESOURCES PLANNING

Group 6C—Cost Allocation, Cost Sharing, Pricing/Repayment

forms of assistance include consultation assistance, provisions for a gradual phase-in of abatement programs, and prompt adjudication of legal actions. (Settle-Wisconsin) W73-01796

FISH PROTEIN CONCENTRATE: PROTEIN VALUE OF LAKE ERIE CARP, SHEEPSHEAD AND ALEWIFE AS RAW MATERIAL, State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.

E. B. Robson. Special Report No 7, May 1970. 18 p, 9 tab, 13 ref.

Descriptors: *Proteins, *Carp, Oil, Economic feasibility, Standards, Lake Brie. Identifiers: *Fish protein concentrate, *Alewife, *Sheepshead, Production, Food and Drug Administration.

The suitability of three species of fish for the manufacture of Fish Protein Concentrate is investigated. The fish employed as raw material were carp, sheepshead, and alewide. All three are common to Lake Erie. The Fish Protein Concencommon to Lake Erie. The Fish Protein Concentrate was synthesized by an isopropanol extraction method and an azeotrophic method using 1,2-dichlorocthane. A statistical analysis of the experiment suggested that synthesis of Fish Protein Concentrate from Lake Erie carp and alewife will yield a product of acceptable protein and cil content. Of the methods employed, counter-current extractions with 2-propanol gave the highest protein yields and least amount of oils. Concentrate produced from sheepshead fell slightly below the protein content accepted by the Food and Drug Administration. However, since both extraction methods produced a sheepshead concentrate that was within one percent of accepted standards, a refinement of the extraction techniques should overcome this deficiency. If a refinement were not remement of the extraction techniques should overcome this deficiency. If a refinement were not feasible, an alternative extraction technique could be employed. Overall, the analysis indicates that a marketable Fish Protein Concentrate can be produced from Lake Brie carp, alewife, and sheepshead. (Settle-Wisconsin)

AOUACULTURE: A NEW ENGLAND PERSPEC-

TIVE. Rhode Island Univ., Narragansett. New England Marine Resources Information Program.

Available from the National Technical Informa-tion Service as COM-72 10322, \$3.00 in paper copy, \$0.95 in microfiche. 1971. 119 p, 1 fig, 3 tab, 61 ref, 3 append.

Descriptors: "Aquiculture, "Fish farming, "Economic impact, "Legal aspects, "Technology, "New England, Economic feasibility, Prices, Income, Aquatic animals.

Identifiers: Criteria.

The potential of aquaculture in New England is examined from technological, economic and legal amined from technological, economic and legal viewpoints. The legal aspects of aquaculture are examined from both a general and specific legal perspective. Floridn's legal experience with aquaculture is specifically examined. A discussion of the technological aspects of aquaculture concentrates on species in the high-price range. Technical criteria applied to the various species include growth rate, conversion efficiency, the availability of feeds, hardiness, simplicity of larval development, and whether or not the species is indigenous to the Northeast. These criteria suggest that salmon, trout, bay scallops, oysters, mussels, digenous to the Northeast. These criteria suggest that salmon, trout, bay scallops, oysters, mussels, hard clams, and freshwater prawn have particularly high potential. The criteria used to assess economic potential included market volume, price, price flexibility, and the possibility of competition from other regions or from natural sup-plies. The species selected under these economic criteria were, with few exceptions, the same as those selected under the technological criteria.

Recommendations were (1) aquaculture experiment stations be established to assist industry, and (2) an investment promotion program be initiated to encourage the private sector to enter the aquaculture industry. (See W73-01800 and W73-01801) (Settle-Wisconsin) W73-01799

A TECHNOLOGICAL PERSPECTIVE, T. A. Gaucher. In: Aquaculture: A New England Perspective, p 7-21, 1971. 3 tab, 7 ref., 1 append.

Descriptors: *Fish farming, *Supply, *Demand, Feeds, Fish diets, Fish diseases, Income, Cultivation, New England.
Identifiers: *Aquaculture, *Seafood.

The demand for quality seafood products is expected to increase substantially during the rest of this century. Between the years 1967 and 2000, projections indicate that shrimp consumption will increase from 328 to 724 million pounds, while shellfish consumption will increase from 166 to 365 million pounds and salmonids consumption from 164 to 362 million pounds. Because the commercial fisheries appear unable to fulfill this increasing demand, cultured products will assume increasing significance. Species considered particularly suited to cultivation in New England include trout, salmon, scallop, and mussel. Other suitable species include oyster, quahog, and freshwater prawn. Extensive or intensive aquafarming techniques can be used to raise these species. Extensive cultivation normally utilizes large areas, tensive cultivation normally utilizes large areas, low management, low capital cost, low operating cost, and low yield on a unit-area basis. Intensive cust, and now yield on a unit-area basis. Intensive cultivation generally utilizes small production units, intensive management, dense stocking, force feeding, and stock selection and manipulation. Early aquacultural development in new England would probably yield best results from an intensive approach. Recent technological advances insive approach. Recent technological advances in intensive aquafarming include new moist diet formulations and controlled environments which can be operated completely closed, partially closed, or as a flow-through system. (See also W73-01799) (Settle-Wisconsin)

AN ECONOMIC PERSPECTIVE, Rhode Island Univ., Kingston. J. M. Gates, and G. C. Matthiesser In: Aquaculture: A New England Perspective, p 22-50, 1971. 1 fig, 54 ref.

Descriptors: *Aquatic animals, *Fish farming *Reconomic feasibility, *New England, Competition, Prices, Salmonids, Oysters, Lobsters, Clams. Identifiers: *Aquaculture, *Economic criteria, *Biological criteria, Scallops.

Biological and economic criteria are developed and applied to various species of aquatic organisms as a means of selecting those most suitable for commercial culture in New England. The biological criteria include environmental adaptability, ability to reproduce in captivity, hardiness of eggs and larvae, food requirements that are readily satisfied, and relatively fast growth rates. The economic criteria include market price and volume, potential competition from natural supplies. Application of these criteria resulted in the rejection of several New England species sometimes considered for culture. These species included Atlantic sea mussel, bloodworm, winter flounder, rock crab, sea scallop, soft shell clam, alewife, shad, Pacific oyster, cham worm, and Irish sea moss. While several species or groups of species autisfied most or all of these criteria, only the European oyster and several salmonid species were Biological and economic criteria are developed ropean oyster and several salmonid species were chosen for further analysis. The salmonid species were chosen for further analysis. The salmonid species of interest include brook trout, rainbow trout, At-lantic salmon, red king (Chinook), and silver

(Coho) salmon. The species which emerged as the most suitable for commercial culture in New En-gland were silver salmon, American lobster, by scallop, hard clam, and European oyster. (See also W73-01799) (Settle-Wisconsin)

PA MONG STAGE ONE FEASIBILITY RE-PORT, APPENDIX V, PLANS AND ESTI-MATES, VOLUME 2. Bureau of Reclamation, Washington, D.C.

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Available from the National Technical Informa-tion Service as PB-207 610, \$3.00 in paper copy, \$0.95 in microfiche. 1970. 247 p, 1 fig, 31 tab. IB-29-00.

Descriptors: *River basin development, *Cost analysis, *Estimated costs, Construction costs, Annual costs, Maintenance costs, Replacement costs, Operating costs, Land development. Identifiers: *Developing countries, Mekong River, Pa Mong Project, Laos, Thailand.

The data and exhibits used in preparing the Plan of Development and Designs and Estimates chapters of the Pa Mong Stage I Peasibility Report are presented. Detailed cost estimates are provided for construction, land development, and annual operation, maintenance, and replacement activities. Construction cost estimates for Pa Mong Dam and Powerplant, Nam Mong Dam, Nam Lik Dam, and all dikes were prepared by estimating comparable costs in the western United States and thea converting these costs to the project construction sites. Similar methods were used for estimating construction costs for some of the promating construction costs for some of the proating construction costs for some of the projects' irrigation distribution systems. Land development costs were divided into respective development costs were divided into respective project construction stages for such components as service unit distribution and drainage systems, vegetation clearing, land forming, and termitemound spreading. Project operation, maintenance, and replacement costs are those expenditures necessary to assure continued operation of the project over a fifty to one hundred year period. These cost estimates were based on the cost experience of the Grand Coulee Dam and Reservoir, which was considered to have amornimately the which was considered to have approximately the same operation and maintenance requirements as the Pa Mong Project. (Settle-Wisconsin) W73-01803

STATE AND LOCAL CAPABILITY TO SHARE

STATE AND LOCAL CAPABILITY OF SHARE FINANCIAL RESPONSIBILITY OF WATER DEVELOPMENT WITH THE FEDERAL GOVERNMENT, Utah Water Research Lab., Logan.
D. H. Hoggan.
Available from the National Technical Information Service as PB-209 143, \$3.00 in paper copy, \$0.95 in microfiche. Water Resources Council, Washington, D.C., 1971. 184 p, 19 tab, 48 ref, append

Descriptors: *Water resources development, *Projects, *Cost sharing, *Cost allocation, Local governments, State governments, Federal govern-ment, Financing, Bond issues, Interest rates, Taxes, California, Louisiana. Identifiers: Borrowings, Interest rate ceilings.

The ability of state and local governments to raise finances, enter into repayment contracts, provide services, or in other ways share costs of water development with the federal government is examined. Legal limitations on state and local public debt were found to be ineffective in limiting total debt. Various means of circumventing total debt. Various means of circumventing these limitations include issuing non-guaranteed debt such as revenue bonds, shifting financial responsibility from more restricted state governments to less restricted local governments, and using lessepurchase arrangements whereby a facility is acquired by long-term lease rather than construc-

Water Law and Institutions—Group 6E

tion. Thus, it appears that every state and local government is able to borrow for capital projects (including water projects). State and local ceilings on interest rates may, however, place some limit on their long-term borrowing. State and local governments were found to vary considerably both in their potential capacity to raise revenue through taxation and in the extent to which they have utilized the fiscal capacity or taxable resources available to them. Water project financing and cost sharing in California and Louisiana are also examined. (Settle-Wisconsin) W73-01806

EVALUATION OF PHYSICAL PLANS—WATER COLLECTION, For primary bibliographic entry see Field 05D.

DYNAMIC ASPECTS ON THE USE OF PRICES FOR PROTECTING THE ENVIRONMENT, Stockholm Univ. (Sweden). For primary bibliographic entry see Field 05G. W73-01811

COMMERCIAL FISHERY INVESTIGATIONS, West Virginia Dept. of Natural Resources, Charleston.

R. Schoumacher. Available from the National Technical Information Service as COM-72-104201, \$3.00 in paper copy, \$0.95 in microfiche. Report prepared for National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Washington, D.C., June 1970. 20 p. 6 fig. 11 tab.

Descriptors: *Commercial fishing, *Channel catfish, *Pish, *Ohio River, Taste, Fish management, *West Virginia. Identifiers: Analysis of variance, Taste testing.

Records of fishing effort and harvest are presented for a commercial fishery operation in West Virginia's portion of the Ohio River. Commercial fishing effort and harvest data are tabulated according to anouth, species, locality, and type of fishing gear. Locality is determined by the navigation pools formed by locks and dams in the Ohio River. In 1969, the two licensed commercial fishermen reported taking 3,250 pounds of fish, 2,450 pounds of which were channel cattish. In 1970, the seven licensed fishermen reported catching 8,498 pounds of fish, with catfish accounting for 7,382 pounds. Samples of channel cattish exposed for three days at various locations in the Ohio and Kanawha Rivers were subjected to evaluation of off-flavor taste by tasting panels at the Bureau of Commercial Fisheries in Ann Arbor, Michigan, and at Oregon State University. The test results showed a seasonal variation. None of the West Virginia samples tested in July scored significantly lower than the control samples, while the November test samples scored significantly lower on both off-flavor and desirability. (Settle-Wisconsin)

A LOCALIZED STUDY OF GRAY IRON FOUN-DRIES TO DETERMINE BUSINESS AND TECHNICAL COMMONALITIES CONDUCIVE TO REDUCING ABATEMENT COSTS. Commins (J. A.) and Associates, Inc., Fort Washington, Pa. For primary bibliographic entry see Field 05G. W73-01815

6D. Water Demand

GENESEE RIVER BASIN STUDY (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Great Lakes Basin Commission, Ann Arbor, Mich. For primary bibliographic entry see Field 08D. W73-01412

WATER RESOURCES PLANNING TO SATISFY GROWING DEMAND IN AN URBANIZING AGRICULTURAL REGION, Utah State Univ., Logan. Coll. of Engineering. T. C. Anderson.

Utah Water Research Laboratory Report PRWG100-1, April 1972. 29 p, 10 fig, 5 tab, 17 ref. Grant No DAC-W31-71-C-0063.

Descriptors: Water resources development, *Resource allocation, *Optimization, *Linear programming, *Water supply, *Water demand, *Irrigation water, *Industrial water, *Municipal water, *Economics, *River basins, *Utah, Estimating, Constraints, Groundwater recharge, Water importing.

Identifiers: *Jordan River basin, *Shadow prices.

A comprehensive, interdisciplinary, flexible methodology is presented for analyzing the economics of water resources developments. The technique is applied to the problem of determining what constitutes a truly adequate water supply for a given region or project. The method is illustrated using an example problem based on data from the Jordan River Basin in Utah. The theory of the demand for irrigation water and its empirical application are discussed. Input-output relationships of production and other activities in each of four subregions are estimated using agricultural budgets. These are combined in a linear programming model. The primal problem is one of resource allocation to utilize the available supplies of water and land to maximize net return. The dual linear programming problem is one of resource syluation and assigns shadow prices to the resources; the dual, representing irrigation possibilities in the Jordan River Basin, is solved at each basis change as the availability of water is varied. Supply functions for irrigation and municipal and industrial water uses are estimated. The optimal allocation of resources is estimated by combining the supply and demand models into a single linear programming problem. It is shown that inter-basin transfers of water to the Jordan River Basin are not an economically feasible solution to meeting increased municipal and industrial demands now or in the foresceable future. (Bell-Cornell)

FACTORS AFFECTING WATER MANAGE-MENT ON THE NORTH SLOPE OF ALASKA, Alaska Univ., College. Inst. of Water Resources. For primary bibliographic entry see Field 04C. W73-01798

WATER SUPPLY AND SEWERAGE. World Bank, Washington, D.C.

World Bank, Sector Working Paper, October 1971. 15 p. 2 tab.

Descriptors: "Water supply, "Sewerage, "Investment, "Water demand, "Planning, Economies of scale. Identifiers: "World Bank, "Developing countries, Social infrastructure, Economic growth.

A World Bank survey of developing countries indicates that a sizable backlog of water supply and sewerage investments exists. The World Health Organization has suggested that by 1980 all of the world's urban population should be provided with either household service or public standpipes. Presently, 49 percent of the urban population in developing countries receives neither service. WHO estimates that new capital investment of 59 billion would be required between 1971 and 1980 to meet these targets in urban areas. The World Bank can assist countries to attain these targets in several ways. It can evaluate and help improve the water and sewerage programs of Bank members,

help strengthen institutions, assist countries to improve project selection, preparation, and execution, and help finance the more important and complex programs. The Bank's financial commitment in the area of water supply and sewerage investments is expected to increase from 5127 milion for the 1964-1968 period to 5495 million for the 1969-1973 period. In terms of the number of operations supported, this represents an increase from 10 to 40. (Settle-Wisconsin)

SOCIOECONOMICS OF MULTIPLE USES, Stone (Ralph) and Co., Inc., Los Angeles, Calif. For primary bibliographic entry see Field 06B. W73.01807

6E. Water Law and Institutions

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.

Available from the National Technical Information Service as COM-72-10111, \$3.00 in paper copy, \$0.95 in microfiche. International Field Year for the Great Lakes, Bulletin No 1, January 1972. 37 p, 13 fig, 2 tab. (Published by National Oceanic and Atmospheric Administration, Rockville, Md 20852).

Descriptors: "Water resources development, "Great Lakes, "Projects, "United States, "Canada, International Water, International Joint Commission, Planning, Water quality control, Water supply, Waste disposal, Recreation, Navigation, Hydroelectric power, Fish conservation, Lake ice, Harbors, Environmental effects, Ecology, Hydrology, Limnology.

Identifiers: "International Field Year for the Great Lakes.

The International Field Year for the Great Lakes (IFYGL) Bulletin has been designed as a means of reporting on the planning, progress, and results of this joint Canadian-United States scientific effort. This first issue gives a preliminary overview of the present status of the organization and planning for the scientific program to be conducted by the United States. The central objective of IFYGL is the development of a sound scientific basis for water resource management on the Great Lakes as an aid in solving problems of water quality and quantity. Lake Ontario and the Ontario Basis were selected as representative of physical characteristics typical of the Great Lakes, and, more generally, as offering the opportunity for investigating typical water resource problems. A series of hydrological and limnological studies, as well as special phenomenological investigations associated with the effects of ice and lake storms, will serve to meet management requirements for environmental factors pertinent to navigation, hydropower, public water supply, waste disposal, particle of the operation of port facilities. (Woodard-USGS)

SUMMARY OF WATER QUALITY STAN-DARDS FOR INTERSTATE WATERS OF KAN-

Kansas State Board of Health, Topeka, Div. of Environmental Health. For primary bibliographic entry see Field 0SG. W73-01315

STATE ENVIRONMENTAL UTILITIES FOR WASTE MANAGEMENT, Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05G.
W73-01356

Field 06-WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

STATE WATER RIGHTS LAWS AND RELATED SUBJECTS: A SUPPLEMENTAL BIBLIOG-RAPHY, 1959 TO MID 1967.
Beonomic Research Service, Washington, D.C.

neous Publication No. 1249, September

Descriptors: *Bibliographies, *State jurisdiction, *Water rights, *Water law, information retrieval, Pederal-state water rights coefficts, Legal aspects, Governments, Water resources, Water allocation (Policy), Federal jurisdiction, International law, Documentation, Publications, Reviews, Legal review.

The bibliography supplements one on the same subject issued by the Department of Agriculture as Miscellaneous Publication 921, December 1962. Included in this supplement are citations, with major topics, based on a survey of the literature published from 1959 to mid-1967 and on responses to formal inquiries sent in 1966 to state and federal agencies concerned with water resources, law schools, water resource centers, agricultural colleges and others. Publications dealing with state water rights laws inchading law review articles and other sources; published proceedings of symposiums, conferences and similar meetings; other lists entitled 'American Law Reports', 'Federal Matters', and 'Interstate and International Matters'; a Publications Index; and an Author Index are included. Special effort was made to achieve comprehensive coverage of publications dealing with state water rights laws. (Ellis-Florida) W73-01389

EMERGENCY DELIVERY OF COLORADO RIVER WATER TO TIJUANA, BAJA CALIFOR-NIA, MEXICO VIA FACILITIES IN CALIFOR-(DRAFT ENVIRONMENTAL IMPACT

STATEMENT). International Boundary and Water Commission,

Available from the National Technical Informa-tion Service as PB-209 043-D, \$3.00 in paper copy, \$0.95 in microfiche. May 1972. 25 p, 2 map, 4 tab, 25 ref.

Descriptors: "Mexico, "Environmental effects, "Water importing, "Treaties, International Boundary and Water Commission, Reservoirs, Dams, Pipelines, Sewage disposal, Beaches, Coastal plains, Water delivery, Coasts, Runoff, Water quality, Sewage treatment, Potable water, Water storage, Water supply, Public health, Water distribution (Applied), Water demand, Water shortage, Colorado River. Identifiers: "Environmental Impact Statements, "Tijuana (Mexico).

Tijuana (Mexico).

To ameliorate a critical water shortage expected to occur in the summer of 1972, negotiations between the Mexican and U.S., governments have been undertaken to supply Tijuana, Mexico, with water from the Colorado River at Parker (Colorado) Dam. Existing American facilities and new facilities to be constructed by Mexico will be utilized for storage and transportation of up to 20,600 acrefect of water per year. The delivery period covers a five year period and new pumping and pipeline facilities are planned for a two-phase program. These facilities include 24 inch main line, a 100 acre-foot ineed distribution reservoir. The beneficial environmental impact from the project is the elimination of the potential public health hazard posed by Tijuana's inadequate water supply. Adverse effects include the destruction of vegetaive cover which provides some wildlife habitat, and a slight increase in the total dissolved mineral content of the Colorado River. No alternatives to the emergency allocation of a portion of Mexico's treaty waters were considered in view of the critical water shortage which presently exists in Tijuana. (Bradley-Florida) W73-01391

UNITED STATES V. UNDERWOOD (UNLAW-

344 F.Supp. 486-496 (M.D. Fla. 1972).

Descriptors: "Florida, "Excavation, "Navigable rivers, "Judicial decisions, Rivers, Running waters, River beds, Riparina land, Rivers and Harbora Act, Permits, Regulation, Legal aspects, River regulation, River flow, Canals, Canal construction, Dredging, Shores.

Identifiers: "Injunctions (Mandatory).

Identifiers: *Injunctions (Mandatory).

Plaintiff United States brought action to compel defendant riparian land owner to restore the bed and shoreline of the river to their original condition or, in the alternative, damages equal to the cost of such restoration. Defendants purchased land on the Weeki Wachee River in Florida and in developing the land excavated a portion of the river, placing the material from the bed and shoreline on the shore to raise the elevation of the property. In addition to alteration of the river, a series of canals were dug. All this was done in violation of the Rivers and Harbors Act of 1899 and had the effect of lowering the water level of the stream. The District Court granted summary judgment as to the navigability of the defendants. The court discussed several tests of navigability and concluded that this river was navigable under the federal test. The court held that defendants excavation was without the recommendation of the Chief of Engineers and the authority of the Secretary of the Army resulting in injury to the mavigability and ecology of the river. (Nielsen-Florida)

POTOMAC SAND AND GRAVEL COMPANY V.
GOVERNOR OF MARYLAND (CONSTITU-TIONALITY OF STATE STATUTE PROHIBIT-ING THE DREDGING OF SAND AND GRAVEL FROM TIDAL WATERS OR MARSHLANDS).

293 A.2d 241-252 (Md. Ct. App. 1972).

Descriptors: "Maryland, "Legislation, "Dredging, "Tidal waters, Protection, Conservation, Constitutional law, Legal aspects, Common law, State governments, Riparian waters, Judicial decisions, Sands, Gravels, Public rights, Natural resources.

Sands, Gravels, Public rights, Natural resources.

Plaintiff sand and gravel company sought declaratory judgment concerning allegad unconstitutionality of a state statute that prohibited the dredging of sand, gravel or other minerals in any of the tidal waters or marshlands of Charles County, Maryland, with exceptions for necessary navigation dredging. Plaintiff was engaged in the business of dredging sand and gravel in the tidal waters surrounding its lands, three parcels of which were in Charles County. Plaintiff contended, inter alia, that Chapter 792 was an unconstitutional taking of private property for a public use without just compensation. Noting that the statute placed riparian owners in the same position as the common law, the Court of Appeals of Maryland held that Chapter 792 is a legitimate exercise of the police power by the legislature to regulate and restrain a particular use that would be inconsistent with or injurious to the rights of the public. The court found the property was within the control of the state and that the preview of the police powers extended to the preservation of the state's exhaustible natural resources. (Ellis-Florida) W73-01418

HARTFORD ELECTRIC LIGHT CO. V. WATER RESOURCES COMM. (OVERHEAD POWER-LINES: AN ENCROACHMENT ON NAVIGABLE WATERS

291 A.2d 721-734 (Conn. 1971).

Descriptors: *Connecticut, *Transmission lines, *Judicial decisions, *Navigable waters, State

governments, Decision making, Transmission (Electrical), Overhead ground wire, Transmission towers, Structures, Eacroachment, Coasts, Tidal waters, Permits, Regulation, Legal aspects, Ad-ministrative agencies, Constitutional law, Legislation. Identifiers: *Administrative law, *Coastal waters.

Identifiers: *Administrative law, *Coastal waters. Plaintiff power company sought a declaratory judgment against defendant water resources commission to determine whether defendant had jurisdiction to regulate location of plaintiff's transmission lines over a navigable river. The defendant commission had approved the location with the condition that the overhead transmission lines be removed and placed under water within five years. Further, an existing transmission line had to be relocated. The Plaintiff claimed that under state statute defendant could not assume jurisdiction unless the encroachment or obstruction adversely affected navigability, an interest of the state or increased hazards from flood waters. The defendant relied on changes in the statute prohibiting erecting any structure in the tidal, coastal, or navigable waters of the state unless the commission issued a permit. The Supreme Court of Connecticut held that electric transmission lines strung across a mavigable river, a domain of the state, are 'encroachements in the tidal waters' within the meaning of Connecticut statutes. The court held that defendant therefore had jurisdiction to regulate the erection of said lines. The court held that there was ample evidence to support defendant's conclusions and to justify the condition requiring eventual underground lines. (Nielsen-Florida) W73-01419

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THE LIFE OF THE SEAS,

A. W. Smith. National Parks and Conservation, Vol 46, p 2 and 35, April 1972.

Descriptors: *Oceans, *International law, *Continental shelf, *International waters, Continental margin, Law of the sea, Mining, Beds under water, Jurisdiction, United Nations, United States, Federal government, Governments, Oil industry, Treaties, Oil pollution, Commercial fishing, Water law, Legal aspects, Political aspects, International commissions.

Identifiers: *Deep sea mining, Coastal waters, Continence some

Contiguous zone.

President Nixon's proposal for the establishment of a world Authority for the regulation of mineral extraction from the seabed is endorsed. The Authority would regulate the mineral extraction from the seabeds beyond a 200-meter depth line and a Trusteeship Zone would be established along the coasts within the 200-meter depth line. This proposal was submitted to the Seabeds Committee of the United Nations. Environmentalists, the world over, are encouraged to organize effective counter-initiatives to the domestic opposition led by the oil industry, since the opposition may be expected to handicap the United States delegation to the Seabeds Committee. Growing pollution of theseas and advanced technologies, which aid the exploitation of resources throughout the ocean, are cited as reasons for establishing the Authority. The Authority would exercise licensing, revenue-collecting, rule-making, inspection, enforcement, adjudicative, and revenue-sharing powers. Revenue from licensing would accrue in part to the expenses of the Authority, making it an autonomous world agency, but in the main to development aid for less affluent nations. (Wheeler-Florida)

PENNSYLVANIA JOINT COMMITTEE RE-PORT ON TOCKS ISLAND, Senate, Washington, D. C. H. Scott. Congressional Record, Vol. 118, p E7703-7705 (daily ed.) September 5, 1972.

Descriptors: "Delaware River, "Water conserva-tion, "Multiple-purpose projects, "Eavironmental effects, Water resources development, Water utilization, Water pollution, Pennsylvania, New Jersey, Water resources, Water policy, Water de-mand, Flood control, Recreation, Recreation de-mand, Water supply, Electric powerplants, Elec-tric power demand. tric power demand. Identifiers: *Tocks Island (Pa).

Identifiers: *Tocks Island (Pa).

Senator Hugh Scott of Pennsylvania acknowledges and applauds the report on the Tocks Island multipurpose development approved August 16, 1972, by the Pennsylvania General Assembly Joint Legislative Air and Water Pollution Control and Conservation Committee. The project will provide flood control, water supply, necreation, and electric energy to a large area. During the Fall of 1971 the committee toured the site of the Tocks Island development on and around the Delaware River between Pennsylvania and New Jersey. It held two days of public hearings, receiving testimony from some 50 parties. The report establishes that there are fixed human water resource needs is and around the Delaware River Basin and that the environmental effect of not meeting these needs are enumerated and evaluated. A complete description of the Tocks Island development is given in the report. Senator Scott recommends the report to all concerned with the need to develop and conserve essential water resources is order to sustain lives and enhance the quality of the environment. Included is a copy of the report which consists of project background, status, description, purposes, costs, alternatives and committee views. (Wheeler-Florida) (Wheeler-W73-01421

WATER POLLUTION CONTROL BILL, House, Washington, D. C. J. Kemp. Congressional Record, Vol 118, p H8169 (daily ed.) September 7, 1972.

Descriptors: "Federal Water Pollution Control Act, "Water Quality Act, "Water pollution control, "Legislation, Pollution abatement, Water pollution, Water quality, Water quality standards, Regulation, Water policy, Legal aspects, Permits, Political constraints, Political aspects, Identifiers: "Environmental Protection Agency.

Congressman Kemp of New York urges other Congressmen to transcend political considerations Congressman Kemp of New York urges other Congressmen to transcend political considerations and vote for the passage of the Water Pollution Control Bill. As an example of the day-to-day planning needs of this bill, Mr. Kemp includes a letter from the Environmental Protection Agency Region II administrator to the Eric County executive in which the administrator cited Congress' failure to amend the construction grants section of the Federal Water Pollution Control Act as a reason for Eric County not meeting the federal abatement schedule. (Wheeler-Florida) W73-01422

WATER SUPPLY STUDY, House, Washington, D. C. J. S. Monagan. Congressional Record, Vol 118, p H8173-H8174 (daily ed.) September 7, 1972.

Descriptors: *Water supply development, *Investigations, *Droughts, *Northeast U.S., Water supply, Water resources development, Connecticut, Data collections, Political aspects, Federal government, Federal jurisdiction. Identifiers: *Corps of Engineers.

Congressman Monagan of Connecticut urges Congress to permit the Corps of Engineers to carry on with the water supply study of Northeastern United States. The study was requested by Congress after a 5-year drought which affected this

area ending in 1967. The study is an engineering as-seasment of over 100 possible projects and will provide a sound basis for final plan formulation and selection. Political motives for discussion and interference with the study should be discontinued until the final report is submitted to Congress. The President and the Congress may then consider the report's proposals and decide if they are worthy of acceptance. (Wheeler-Florida) W73-01423

PRESIDENT'S ENVIRONMENTAL LEGISLA-TIVE PROGRAM, Senate, Washington, D. C. M. O. Hatfield. Congressional Record, Vol 118, p S14476-S14477 (daily ed.) September 11, 1972.

Descriptors: *Legislation, *Clean Air Act, *Water Quality Act, *Federal Water Pollution Control Act, Recreation facilities, National Recreation areas, Water pollution control, Relocation, Waste disposal, Land use, Electric powerplants, Water resources development, Conservation, Federal government, Political aspects. Identifiers: *National Land Use Policy Act, *Na-tional Resource Land Management Act.

tional Resource Land Management Act.

Senator Hatfield of Oregon presents a summary of President Nixon's environmental legislative program. Only six of the President's environmental legislative proposals submitted to Congress between 1970 and 1972 have been enacted, and the Clean Air Act Amendments of 1970 was the only major proposal passed. The major bills pending before Congress are: (1) water quality, (2) perticides, (3) noise, (4) ocean dumping, (5) toxic substances, (6) National Land Use Policy Act and National Resource Land Management Act, (7) strip and underground mining, (8) power plant siting, (9) predator control, (10) endangered species, (11) Gateway National Recreation Area, (12) Golden Gate National Recreation Area, (13) toxic waste disposal, (14) sediment control, (15) land and water conservation fund amendments, (16) Bigypress National Recreation Area, (17) Environment Financing Authority, (18) authorization of expenses for relocation of federal facilities, (19) four proposals on marine pollution conventions, (20) Oil Pollution Amendments of 1972, (21) bridge-to-bridge telephones, (3) Port and Waterways Safety Act, (4) Amendment to the Surplus Property Act, (5) Oil Pollution Intervention Convention and Convention to Reduce International Oil Discharges. (Wheeler-Florida)

THE BLUE RIDGE POWER PROJECT, House, Washington, D. C. W. Mizell.

Congressional Record, Vol 118, p E7851-E7852 (daily ed.) September 12, 1972.

Descriptors: *Legislation, *Hydroelectric plants, *Dam construction, *North Carolina, Virginia, West Virginia, Conservation, Water pollution, water pollution control, Industrial wastes, Reservoirs, Multiple-purpose projects, Legal aspects, Water supply, Aesthetics, Water resources development, Flooding. Identifiers: *Federal Power Commission, *Environmental Protection Agency, *New River, North Carolina and Virginia.

Representative Mizell of North Carolina introduces legislation to prohibit the Federal Power Commission or any other federal agency from liceasing the proposed Blue Ridge power project on the New River in North Carolina and Virginia. The purpose of this legislation is to aid the conservation of natural water resources and protect the New River, and to guard against setting a national

precedent for accepting a pollution abatement procedure that might eventually drown half of America. The proposed project calls for the flooding of 40,000 acres of land in Ashe and Alleghany Counties, North Carolina for the purpose of storing water for power and washing away industrial pollution 250 miles downstream in Charleston, West Virginia. Hearings on the project have been held by the Senate Public Works Committee and the Federal Power Commission. The Environmental Protection Agency has reviewed the case and has raised some serious environmental objections to the project and has asked the Federal Power Commission to give the Environmental Protection Agency responsibility for resolving those objections before the project continues. The Federal Power Commission is expected to issue its decision on licensing the project in the near future. (Wheeler-Florida)

AN EVALUATION OF WATER POLLUTION CONTROL IN AND BY THE STATE OF OKLAHOMA, Oklahoma Univ., Norman. For primary bibliographic entry see Field 05G. W73-01444

CHANGES IN ADMINISTRATIVE PROCEDURES MANUAL.
California State Water Resources Control Board, nary bibliographic entry see Field 05G. For primar W73-01581

IN SUPPORT OF FLOOD CONTROL. House, Washington, D.C. F. Thompson, Jr. Congressional Record, Vol 118, p E7011-E7012 (daily ed.) July 25, 1972.

Descriptors: *Legislation, *Flood control, *Water supply, *Dams, Multiple-purpose projects, Storm runoff, Hurricanes, Water yield, Lakes, Delaware River, Flood protection, Flood damage, Floods, Damages, Storms, Dam construction, Water supply, Water supply developments.

suppty, water suppty developments.

Concomitant with the vote on emergency flood relief funds to aid those towns and cities recently devastated by Hurricane Agnes, members of Congress are reminded of the need for flood control measures. The Delaware River Valley was spared destruction from this storm but concern was expressed that if the authorized flood control program for this area. Tocks Island Dam being the principal facility-is delayed, a similar storm would cause enormous damage in terms of lives and property. The primary purpose of the Tocks Island dam are to create flood control and water supply. The project has come under fire from the Sierra Club and the New York Times. The proposents maintain that the safety and drinking water needs of 10 million people in the Delaware Valley take precedent over the aesthetic desire of a thousand nikers in the Sierra Club. (Nielsen-Florida)

WASHINGTON POST DEBATES ITSELF OVER POLLUTION CONTROL, House, Washington, D.C. W. Patman. Congressional Record, Vol 118, p H 7133-H 7135

(daily ed.) August 2, 1972.

Descriptors: *Legislation, *Sewage treatment, *Water treatment, *Costs, Expenditures, Waste treatment, Treatment, Sewage disposal, Waste disposal, Waste water disposal, Federal government, Political aspects, Wastes, Political aspects, Wa

Field 06-WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

Congressman Wright Patman included in the Record two editorials from the Washington Post and his reply letter concerning the Emergency Community Facilities and Public Investment Act of 1972 dealing with water and sewer facilities. The first editorial (repeated elsewhere in the Record) applauded the demise of this piece of legislation. The second editorial strongly encouraged continued pollution control measures and suggested the administration was not doing enough to push the pollution control bills in the Congress. It called for the 'rescuing' of water quality bills in Congress. Patman attacked the first editorial. There is a tremendous need by thousands of communities for water and sewer facilities. There exists a backlog of applications requesting \$12 billion for such facilities. The National League of Cities estimates that a total of \$33-37 billion will be needed for sewage treatment facilities alone in cities during the period 1971-1976. Law suits are being brought daily to stop dumping of raw sewage, yet some claimed there was no need for this legislation. (Nielsen-Florida)

THE LAW OF THE SEA CONFERENCE—GENESIS AND PROSPECT FOR AGREEMENT IN

D. H. Clausen. Congressional Record, Vol 118, p E7230-E7232 (daily ed.) August 1, 1972.

Descriptors: "Ownership of beds, "Exploitation, "Law of the sea, "International law, Conferences, International waters, Oceans, Commercial fishing, Boundaries (Property), Economics, Mining, Oli fields, United Nations, Foreign countries, Governments, Coasts, Continental shelf, Political aspects, Political constraints, Treaties.

Identifiers: "Coastal waters, "Law of the Sea Conference" "Free passages." ference, *Free passage.

In the past the Law of the Sea Conferences have been unable to resolve two important issues: ex-cessive jurisdictional claims and over-exploitation of fishery resources. By 1966 the United States had adopted two measures, the nine-mile Con-tiguous Fisheries Zone and the Fishermen's Pro-tective Act, to make up for the deficiencies in exaguous risneries Zone and the Fishermen's Pro-tective Act, to make up for the deficiencies in ex-isting international law. In 1970 the United Nations approved a resolution calling for an international conference in 1973 on the Law of the Sea, bringing together the parallel issues of sea-bed resource development, territorial seas and fishery jurisdic-tion. The United States is prepared to accept ex-tension of territorial seas to twelve miles provided the right to free passage through international straits is recognized. The U.S. contemplates three levels of jurisdiction of the sea-bed. From shore to a depth of 200 meters the coastal states would ex-ercise exclusive jurisdiction. An intermediate zone from 200 meters to deep sea would be in trustee-ship of development. Exploitation of the deep sea-bed would be entirely international in character. Jurisdiction over coastal species of fish dependent upon shallow waters of the Continental Shelf would be delegated to the coastal state. (Nielsen-Florida)

ENVIRONMENTAL IMPROVEMENT THROUGH WATERSHED PROGRAMS, Senate, Washington, D.C. H. E. Talmadge. Congressional Record, Vol 118, p S13372-S13374

(daily ed.) August 11, 1972.

Descriptors: "Watershed management, "Flood protection, "Legislation, "Water quality control, Runoff, Surface runoff, Droughts, Irrigation, Sedimentation, Recreation, Wildlife, Flood control, Floods, Erosion control, Conservation, Soil conservation, Water conservation, Water conservation,

Opportunity exists for the Rural Development Act of 1972, now pending in the Senate, to offer new ways and means to help local conservation districts in building rural America. One important contribution will be improvement of the environment through watershed programs, which are administered by the Soil Conservation Service. The impact of the small watershed program on the environment includes reduction in frequency and depth of flooding in farm, urban and residential areas; conservation treatment of farms in the watershed; reducing water run-off and sedimentation; improvement of water quality; and assurance of greater water supply. Most watershed projects also include recreational facilities and a growing number include planned improvements in fish and wildlife habitat. (Nielsen-Florida)

INDUSTRY ENVIRONMENTALISTS, House, Washington, D.C. J. M. Collins. Congressional Record, Vol. 118, p E7412 (daily ed.) August 10, 1972.

Descriptors: "Political aspects, "Industries, "Costs, "Pollution abatement, Industrial waster, Industrial plants, Cooling towers, Engineering structures, Recycling, Waste treatment, Waste water treatment, Water treatment, Water pollution treatment, Neutralization, Limestones, Treatment facilities.

The cost of controlling air and water pollution makes a one year-100 per cent solution to the problem impossible. Industry, however, is taking tremendous strides forward in improving our environment. For example, one major corporation, which reported a \$24 million profit last year, announced plans to spend \$14 million in pollution control devices. These devices included a central waste water treatment facility, a system for recycling water, a cooling tower and a waste water collection system. These treatment facilities cost \$4 million a year maintenance and if this program continues for three more years they will have an annual expense for environmental improvement of \$12 million. Unreasonable congressional requirements may have serious economic repercussions. Long-range planning with common sense environmentalism is the answer for a greater America for tomorrow. (Nielsen-Florida)

PRESIDENT'S MESSAGE ACCOMPANYING THE REPORT OF THE COUNCIL OF ENVIRONMENTAL QUALITY,

R. M. Nixon.
Congressional Record, Vol 118, p S12943-S12946
(daily ed.) August 7, 1972.

Descriptors: "Political aspects, "Legislation, "Pol-lution abatement, "Environmental effects, Federal government, Governmental interrelations, Governments, Regulation, Water quality stan-dards, Rivers and Harbors Act, Government finance, Economics, Financing, International law, Water quality. Identifiers: "National Environmental Policy Act, "Council on Environmental Quality.

The Third Annual Report of the Council of Environmental Quality examined such issues as the need for indices of environmental quality and forecasting, the costs and impact on the economy of pollution control requirements, and the effects of environmental standards on international trade. of environmental standards on international trade. Also offered is an assessment of how the U.S. is faring in environmental cleanup. While the quality of the air is improving a major battle lies ahead to restore the quality of our waters. The President's message outlines several programs that were passed during his administration, discusses the increase in regulatory and enforcement actions and summarizes the ever higher level of federal funding for environmental protection. The President calls for new legislation in a number of areas of na-tional concern and lists recent efforts to join of na-tions in the field of international environmental activity. (Nielsen-Florida) W73-01587

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AUSTRALIAN MULTI-PURPOSE AUTHORITY, Metropolitan Water, Sewage and Drainage Board, Sydney (Australia). B. J. Walder.

E. J. Walder. Effluent and Water Treatment Journal, Vol 5, No 12, p 243-246, May 1972. 2 fig.

Descriptors: "Water supply, "Sewerage, "Storm drains, Costs, Benefits, Economies of scale, Water supply development, Storm water. Identifiers: "Metropolitan water, Sewerage and Drainage Board, Sydney (Australia).

Drainage Board, Sydney (Australia).

Responsibility for the provision of water, sewerage facilities, and major drainage for Sydney, Australia, rests with the Metropolitan Water, Sewerage and Drainage Board. Within the 4,000 square miles under its control, the Board is the sole authority for the storage of water and its distribution to individual properties as well as for conveying and treating waste water from those properties. The average water consumption in the Board's area is approximately 300 million gallons a day. Since the area is occasionally subject to long severe droughts, the Board must maintain very large water storages in order to guarantee supply. The Board keeps a continuous check on the quality of the water supply, taking more than 19,000 samples annually from selected points. The Board provides sewerage services for 2,500,000 people, and is extending its service to more than 120,000 additional people each year. Also, the Board is responsible for major storm-water systems which drain substantial area. The Board's size creates problems in communication and supervision, but these disadvantages appear to be more than offset by the economies of scale. (Settle-Wisconsin) W73-01589

POLLUTION FACILITIES CONTINUE TO PRO-VIDE SUBSTANTIAL TAX BENEFITS, Hamel, Park, McCabe and Saunders, Washington, D.C.; and Hamel, Park, McCabe and Saunders, Chicago, Ill. K. M. Worthy. The Journal of Taxation, Vol 37, No 1, p 2-4, July

Descriptors: "Pollution abatement, "Facilities, "Taxes, Depreciation, State governments, Local governments. Identifiers: "Tax shelter, "Accelerated depreciation, "Investment tax credit, Industrial development bonds, Economic incentives.

ment bonds, Economic incentives.

Present federal tax laws offer several significant incentives for the construction or installation of pollution control facilities. Section 169 of the Tax Code permits rapid amortization over a period of 60 months of new pollution control facilities. Such amortization is available at the election of the taxpayer. To qualify for this preferential tax treatment, the facilities must be designed to 'abate or control water or atmospheric pollution or consmination by removing, altering, disposing or storing of pollutants, contaminants, waste or heat. 'The 7 percent investment tax is not available to property for which rapid amortization is claimed. Consequently, the ultimate tax saving of writing off an asset over five years under rapid amortization, as compared to eight or ten years under ordinary depreciation, is not likely to equal an immediate tax saving of 7 percent of the cost of the asset under the investment credit. Also, major pollution facilities can be financed through the issuance of tax-empt industrial development bonds by a state or local government. Combining these tax incentives can generate savings of up to 25 percent of installation cost. (Settle-Wisconsin)

W73-01590

SEWAGE TREATMENT AT SEA. Process Co., Inc.
For primary bibliographic entry see Field 05D.

CLEANING UP THE WATERWAYS, Corps of Engineers, Washington, D.C. For primary bibliographic entry see Field 05G.

POLLUTION: THE CRIME OF THE TIMES, Coast Guard, Portland, Oreg. For primary bibliographic entry see Field 05G. W73-01653

1972 COMPENDIUM, STATE WATER POLLU-TION CONTROL AGENCIES WITH REGULA-TORY/POLICY-MAKING RESPONSIBILITY. Environmental Protection Agency, Washington, D.C., Office of Interpovernmental Programs. For primary bibliographic entry see Field 05G. W73-01750

AQUACULTURE: A NEW ENGLAND PERSPEC-TIVE.
Rhode Island Univ., Narragansett. New England Marine Resources Information Program. For primary bibliographic entry see Field 06C. W73-01799

WATER SUPPLY AND SEWERAGE.
World Bank, Washington, D.C.
For primary bibliographic entry see Field 06D.
W73-01802

STATE AND LOCAL CAPABILITY TO SHARE PINANCIAL RESPONSIBILITY TO SHARE
PINANCIAL RESPONSIBILITY OF WATER
DEVELOPMENT WITH THE FEDERAL
GOVERNMENT,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 06C.
W73-01806

WATER AND RELATED LAND RESOURCES MANAGEMENT. THE CHALLENGE AHEAD. Water Resources Council, Washington, D.C.

Available from the National Technical Informa-tion Service as PB-209 156, \$3.00 in paper copy, \$9.95 in microfiche. Seminar Summary, February 1971. 81 p, 4 append.

Descriptors: "Water resources development, "Federal government, "State governments, Planning, Management, Coordination, River basins.

dentifiers: *Water Resources Planning Act,
*Water Resources Council, Federal programs,
Commissions, Field institutions.

A five-year review of the Water Resources Planning Act was made at a seminar sponsored by the Interstate Conference on Water Problems and the Water Resources Council. The seminar's three the Water Resources Council. The seminar's three panels focused on approaches to coordinating federal programs, providing workable field institutions, and strengthening the states. Topics discussed by the panelists on coordinating federal programs included (i) reorganizations compared with changes in present programs, (2) the Water Resources Council and design for a national water resources development plan, (3) the role of citizens in water resources planning, (4) the state's role in coordinating federal water resources planning, (5) the Water Resources Council as a federal coordinating mechanism, and (6) the need for centralized management and budget control. Among the topics discussed by the panel on field institutions were (1) river basin commissions established under the Water Resources Planning Act, (2) the role of interstate and federal-interstate compacts, and (3) the Southeast Basins Inter-Agency Committee. The third panel examined how states can use the Water Resources Planning Act to strengthen their positions relative to the federal government. Two papers delivered at the seminar are provided in the appendices. (Settle-Wisconsin) W73-01814

GREAT LAKES BASIN COMMISSION, AN-NUAL REPORT, FISCAL YEAR ENDING JUNE Resources Council, Washington, D.C.

Available from the National Technical Informa-tion Service as PB-209 163, \$3.00 in paper copy, \$0.95 in microfiche. June 1970. 27 p, 1 map, 13 photo, 2 chart.

Descriptors: "Great Lakes region, "Lake basins, "Water Resources Planning Act, "Comprehensive planning, Water resources development, Basins, Lakes, Lake Brie, Lake Huron, Lake Michaga, Lake Ontario, Lake Superior, Great Lakes, Interstate commissions, Planning, Legal aspects, Recreation, Wildlife habitats, Erosion control, Sedimentation, Water quality, Aesthetics, Fisheries, Navigation. ries, Navigation. Identifiers: *Great Lakes Basin Commission

An overview is presented of the Great Lakes Basin Commission's major activities during the 1970 fiscal year. Accomplishments to advance the coordination of planning and development of a comprehensive, coordinated joint plan for federal, state, interstate, local, and nongovernmental development of water and related land resources in the Great Lakes Basin excitement. These development of water and related land resources in the Great Lakes Basin are discussed. Those aspects of the overall work which are expected to be of major concern or significance during the coming year are discussed. A primary objective for the coming year will be the encouragement of greater participation in the Commission planning activity by local planning bodies. Work group activities for each field of concern are summarized for the entire basin area. (Ellis-Florida)

OHIO RIVER BASIN COMMISSION, ANNUAL REPORT, FISCAL YEAR ENDING JUNE 30,

Vater Resources Council, Washington, D.C.

Available from the National Technical Informa-tion Service as PB-209 167, \$3.00 in paper copy, \$0.95 in microfiche. June 1971. 12 p, 1 map, 7 photo, 1 tab.

Descriptors: *Ohio River, *River basins, *River Descriptors: "Ohio River, "River basins, "River basin commissions, "River basin development, River systems, Watersheds (Basins), Rivers, Administrative agencies, Interstate commissions, Water Resources Planning Act, Ohio, Indiana, Kentucky, West Virginia, Illinois, Maryland, New York, North Carolina, Pennsylvania, Tennessec, Virginia, Comprehensive planning, Water resources development. Identifiers: "Ohio River Basin Commission.

This annual report covers fiscal 1971, the first year of the Ohio River Basin Commission's operation. The organizational meeting of the Commission was held in March 1971, and general operational policies and programs were formulated. Actions were taken to complete and transmit the Kanawha were taken to complete and transmit the Kanawha and Wabash Type II River Basin studies, and negotiations for staffing were undertaken. The Ohio River Basin encompasses some 163,000 square miles and a population of over 20 million people in eleven states. The Basin contains 1,900 public water systems serving more than 13 million people, 170 of the major manmade reservoirs in the United States, one million surface acres of water, and 2,100 miles of navigable waterways carrying more than 140 million cargo tons per year. The Commission is striving to enhance the quality and value of the Basin's resources through development of a comprehensive, coordinated joint plan and establishment of systemized priorities. (Ellis-Florida)

EROSION AND FLOODING IN NORTHEAST OHIO-MORE COSTLY PROOF THAT FEDERAL SHORE PROTECTION LEGISLA-TION IS NEEDED IMMEDIATELY,

House, Washington, D.C. C. A. Vanik. Congressional Record, Vol 118, p E6578-E6579 (daily ed.) June 28, 1972.

Descriptors: "Shore protection, "Legislation, "Ohio, "Grants, Lake Erie, Storms, Soil erosion, Beach erosion, Shores, Lake shores, Boundaries (Property), Public benefitis, Cost-benefit analysis, Federal government, Government supports, Government finance, Local governments, Political aspects, Riparian land. Identifiers: *Corps of Engineers.

The problems of shore erosion are discussed in a statement in support of H.R. 13689 which would authorize federal assistance for protecting shorelines in areas where benefit-cost-ratios which shorelines in areas where benefit-cost-ratios which justify such. The national problem is stressed by analyzing the specific area of Northeast Ohio which borders Lake Erie and its critical erosion problem. The shore erosion in this area is unusually fast with chunks over twenty feet wide falling into the lake at various times. A study has indicated that by the year 2020, 1.9 million cubic yards of earth will fall into the lake from a four mile stretch alone. Under current legislation the private landowner along the shore can receive no federal assistance. H.R. 13689 permits federal assistance to private landowners where such assistance is justified. Some of the weaknesses of current Corps of Engineers shore protection deterassistance to private landowners where such assistance is justified. Some of the weaknesses of current Corps of Engineers shore protection determination factors are also emphasized. These include not classifying public streets, utilities, and tax revenue as in the public benefit; estimating project benefits only over a 50-year period when project life actually exceeds 100 years; and not protecting private property between public property and the water. (Ellis-Florida)

GLOVER V. WALTER (SUFFICIENCY OF EVIDENCE TO SUPPORT TRIAL COURT'S DETERMINATION THAT LAND FORMATION AROSE BY ACCRETION).

483 S.W.2d 713-715 (Ark. 1972).

Descriptors: "Arkansas, "Boundaries (Property), "Accretion (Legal aspects), "Land tenure, Judicial decisions, Land, Legal aspects, Islands, Rivers, Channels, Boundary disputes, Riparian land, Water law, Riparian rights.

Appellees, west bank riparian landowners, sought to have title to certain property on the Arkansas River quieted as against appellants, east bank riparian landowners. Appellee contended that the land in question developed by accretion to the west bank with title accredited to his property. Appellant contended that the land developed as an island and that by Arkansas statutes title to that portion lying within his original boundaries vested in him. The Supreme Court of Arkansas held that the lower court's finding for appellee was contrary to the preponderance of the evidence which showed that the land in question developed as an island within well established channels on both the east and west sides of the river and not by accretion to appellees' property. The court further held

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that a series of aerial photographs, maps and plats which were made over a period of years and which revealed a prominent land formation surrounded by the river channel, were sufficient to show that the land developed as an island and not as an accretion. (Ellis-Florida) W73-01923

BALBACK V. MOE (DRAINAGE OF MEAN-DERED LAKES BY DIVERSION OF WATERSHED SURFACE RUNOFF).

200 N.W.2d 901-905 (Minn. 1972).

Descriptors: "Minnesota, "Drainage effects, "Ditches, "Judicial decisions, Permits, Drainage, Effects, Water level, Diversion structures, Natural resources, Watersheds (Basins), Legal aspects, Water law, Legalation, Local governments, Regulation, Runoff.

lation, Runoff.

Appellee petitioned for construction of a County ditch within the watershed area of Boise Lake to reclaim land by draining two sloughs. The ditch, as approved by the County, would divert the runoff of surface waters from some of the watershed acreage of meandered Boise Lake. Appellant contended that the ditch would have the same effect on the Lake's water level as establishing a drainage outlet for the lake itself, and thus the County Board's order was unlawful because no drainage permit had been obtained from the Commissioner of Natural Resources as required by Minnesota law. The Supreme Court of Minnesota held that the draining of a meandered lake, within the contemplation of section 106.021, Minnesota Statutes, does not consist solely of emptying already collected water from the lake but also includes, upon proper proof of effect on the lake's water level, the diversion of surface runoff from the watershed area of the lake. The court ruled that trial court's conclusion that the proposed ditch would have no appreciable effect on the level of water in Boise Lake was not clearly erroneous. Therefore, there was no requirement for permission from the Commission. (Ellis-Florida)

RESERVE MINING CO. V. MINNESOTA POL-LUTION CONTROL AGENCY (STATE COURT'S AUTHORITY TO DIRECT AGENCY TO ISSUE A VARIATION TO DISCHARGE REGULATIONS). For primary bibliographic entry see Field 05G. W73-01925

UNITED STATES V. BUSHEY AND SONS, INC. (FEDERAL COMMON LAW NUISANCE AS A GROUND FOR POLLUTION ABATEMENT). 346 F. Supp. 145-151 (D. Vt. 1972).

Descriptors: *Common law, *Federal jurisdiction, *Judicial decisions, *Ships, Safety, Hazards, Legislation, Rivers and Harbors Act, Federal government, Oil spills, Seepage, Regulation, Petroleum, Legal aspects, Lakes, Navigable waters, Vermont, Water pollution sources, Constitutional law.

Identifiers: *Nuisance (Legal aspects).

Plaintiff United States instituted proceedings in Plaintiff United States instituted proceedings in equity seeking a permanent injunction requiring defendant shipper to observe specified safety regulations. Defendant owned and operated vessels used to transport liquid cargoes across Lake Champlain to Vermont. Plaintiff alleged that defendant violated the Refuse Act on seven occasions subsequent to 1967, causing oil spills and seepages. Defendants moved for dismissal on the ground that an injunction would not lie under the Refuse Act absent a continuous statutory violation and on the ground that plaintiff had an adequate remedy at law. The United States District Court for Vermont held that the claim was actionable, irrespective of statutory law, under federal common law of nuisance. The court further held that the federal government, in protecting the environment, is not limited to laws enacted by Congress to control pollution. The court ruled that the extant laws and regulations were not exclusive. The court also ruled that defendant's claim that the plaintiff's remedy at law was adequate could only be resolved by the trier of the facts on the merits of the case. (Nielsen-Florida)

MADDOX V. BRADLEY (NATIONAL EN-VIRONMENTAL POLICY ACT DENIED RETROACTIVE APPLICATION).

345 F. Supp. 1255-1260 (N.D. Tex. 1972).

Descriptors: "Judicial decisions, "Access routes, "Condemnation, "Project planning, Legal aspects, Eminent domain, Planning, Compensation, Ad-ministrative agencies, Federal government, Boun-daries (Property), Adjacent landowners, Environ-mental effects. Identifiers: "National Environmental Policy Act.

Identifiers: *National Environmental Policy Act.

Plaintiff landowners aought to enjoin defendant Bureau of Reclamation's proposed action in awarding contract to erect fence on boundary line between tract acquired by the federal government from plaintiffs in earlier condemnation proceeding and adjoining tracts owned by plaintiffs. Defendant had condemned 6,816.5 acres of plaintiffs were fully compensated for the land, including damages for loss of right-of-access to water on the land for watering of cattle. The United States Northern District Court of Texas granted defendant's motion to dismiss and held the government obtained fee simple title to the land in the condemnation proceeding. The court rejected the plaintiff's argument that the defendant's action of fencing the land violated the National Environmental Policy Act. The court refused to apply NEPA retroactively where the planning for the entire project was completed prior to enactment of NEPA. Furthermore, the court ruled that it was unreasonable to assume that Congress intended to require an additional environmental study on a relatively small part of the entire project. (Nielsen-Florida)

W73-01927

UNITED STATES V. BENTON AND CO. (CON-TINUING OFFENSES AND PROPER PLEADING UNDER RIVERS AND HARBORS ACT).

345 F. Supp. 1101-1104 (M.D. Fla. 1972).

Descriptors: *Judicial decisions, *Rivers and Har-bors Act, *Alteration of flow, *Navigable waters, Legal aspects, Penalties (Legal), Landfills, Regu-lation, Administrative agencies, Law enforce-ment, Legislation, Permits, Federal jurisdiction.

ment, Legislation, Permits, Federal jurisdiction.
Plaintiff United States brought prosecution under the Rivers and Harbors Act of 1899 and defendant company moved to dismiss the information. Defendant allegedly placed unauthorized obstructions in navigable waters without permission of the Chief of Engineers. Defendant contended that the information was defective in that it (1) violated Rule 8 of Federal Rules of Criminal Procedure since it duplicitously charged two offenses under the Act in one count, and (2) failed to state in certain terms the time or date of the offense charged. The U.S. Middle District Court of Florida denied the motion and held the information charged a continuing offense, beginning at a time unknown and continuing to the date of the information. The court ruled that where an offense is continuing in auture the date of commencement of the violation need not be alleged. In interpreting the Act, the court stated that it was not duplicitious to charge defendant did fill, alter, and modify the condition of a navigable water without authorization. The

statute specifies several alternative ways in which an offense can be committed and the indictment may allege these several ways in the conjunctive and conviction thereon will stand if the proof of one or more of the means is sufficient. (Nielsen-Florida) Florida) W73-01928

GULF OIL CORP. V. MORTON (SUSPENSION ORDERS PURSUANT TO OUTER CONTINEN-TAL SHELF LANDS ACT). 345 F. Supp. 685-689 (C.D. Cal. 1972).

Descriptors: *Offshore platforms, *Oil wells, *Leases, *Judicial decisions, Legal aspects, Coatracts, Shore protectios, Coastal structures, Shores, Continental shelf, Channels, Oil spills, Oil pollution, Oil reservoirs, Drilling, Test wells, Administrative agencies, Regulation, Legislation. Identifiers: *Coastal waters, *Outer Continental Shelf Lands Act.

Shelf Lands Act.

Action was initiated by plaintiff lessee for relief in nature of mandamus and declaratory relief from suspension order issued by defendant Secretary of Interior. Lesses were issued in 1968 under the Outer Continental Shelf Lands Act at which time plaintiffs paid adequate consideration to the United States. The leased premises were located in the Santa Barbara Channel, off California, and were used by plaintiffs to conduct exploratory drilling After a 'blow-out' in the Santa Barbara Channel caused an oil spill the Secretary suspended operations on the leases to permit Congress to consider pending legislation. The United States District Court for the Central District of California held that the Secretary exceeded his authority under the Outer Continental Shelf Lands Act. The suspension was not in keeping with the purpose of the Act. The court noted that under the Act suspension was limited to times of national emergency or state of war. Although the Secretary has the power to promulgate rules to carry out the provisions of the Act, the suspension here was not for purposes related to the Act. (Nielsen-Florida) W73-01929

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GREAT LAKES BASIN COMMISSION, ANNUAL REPORT, FISCAL YEAR ENDING JUNE Water Resources Council, Washington, D.C.

Available from the National Technical Informa-tion Service as PB-209 179, \$3.00 in paper copy, \$0.95 in microfiche. June 1971. 24 p, 1 map, 2

Descriptors: "Great Lakes region, "Lake basins, "Comprehensive planning, Water Resources Planning Act, Water resources development, Basins, Lakes, Lake Eric, Lake Huron, Lake Michigan, Lake Ontario, Lake Superior, Great Lakes, Interstate commissions, Planning, Legal aspects, Recreation, Wildlife habitats, Flooding, Brosion control, Sedimentation, Water quality, Aesthetics, Fisheries, Navigation.

Identifiers: "Great Lakes Basin Commissions.

An overview is presented of the Great Lakes Basin Commission's major activities during the 1971 fiscal year. Commission activities related to four basic responsibilities are reviewed: serving as principal agency for the coordination of all water resource planning in the Basin; preparing the basic comprehensive, coordinated, joint plan for Basin water and related land resources; recommending a long-range schedule of priorities for resource-related programs and projects; and fostering additional studies necessary for preparation of the basin plan. The Commission's coordination activities and the Commission's participation in joint United States-Canadian discussions and actions centering on boundary water matters are stressed. Also summarized are the Commission's expectations for fiscal year 1972. (Ellis-Florida) W73-01930

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NEW ENGLAND RIVER BASINS COMMIS-SION, ANNUAL REPORT, FISCAL YEAR 1971. Water Resources Council, Washington, D.C.

Available from the National Technical Informa-tion Service as PB-209 169, \$3.00 in paper copy, \$0.95 in microfiche. June 1971. 57 p, 1 map, 11 photo, 2 append.

Descriptors: "River basin commissions, "New England, "River basin development, "Water resources development, River basins, Water Resources Planning Act, Resources development, Comprehensive planning, Optimum development plans, Interstate commissions, Legislation, Hanning, Federal government, State governments, Coasts, Regulation. Identifiers: "New England River Basins Commissions."

An overview is presented of the New England River Basins Commission's major activities during fiscal year 1971. Summarized are the steps made toward development of a comprehensive water and related land resources management program for the region, the regional courses of action toward effective management of flood plains, state leadership in coastal zone planning and management, and methods of decision making used in electric power plant siting. Also summarized are the programs which are underway or in preparation and which will lead to the creation of an overall water and land related resource blueprint for the region. Also summarized is recent land and water use legislation in the several New England states. (Ellis-Florida) England str W73-01931

BOROUGH OF NEPTUNE CITY V. BOROUGH OF AVON-BY-THE-SEA (MUNICIPALITY'S RIGHT TO CHARGE DISCRIMINATORY BEACH USER FEES).

294 A.2d 47-57 (N.J. 1972).

Descriptors: "Public lands, "Public access, "Judicial decisions, Beaches, Recreation, Public rights, Legal aspects, Cities, Coasts, Seashores, Recreation facilities, Shores, Recreation demand, Economics, Water sports, Water policy, Water utilization, Water law, New Jersey, Legislation. Identifiers: "Public trust doctrine, "Coastal

Defendant, oceanfront municipality, passed an ordinance setting fees for persons using the beach which charged higher fees to non-residents. Plaintiff, a nearby municipality and two of its residents, brought suit to set the ordinance aside. Plaintiff attacked the ordinance based upon a claim of a common law right of access to the ocean existing with all citizens of the state. Defendant, although recognizing such right, contended that its property taxpayers should not have to bear the added expense, caused by non-resident users, above non-discriminatory beach user fees received, of maintaining the beachfront. The New Jersey Supreme Court held that tidal land lying between the high and low water marks as well as the ocean covered land seaward is owned by the State in fee simple under the public trust doctrine. Although the uplands is owned by the municipality, reasonable public access to the ocean exists including access for recreational purposes. The court raled that municipalities may validly charge reasonable fees for the use of their beaches, but they may not discriminate in any respect between their residents and non-residents. The court ruled that since the city had operated and planned its financial affairs based upon the present ordinance, it would be unfair to invalidate the ordinance retroactively. (Crow-Florida)

HAMLIN V. MATARAZZO (DRAINAGE CON-SIDERATIONS-AN ESSENTIAL ELEMENT IN

PLANNING BOARD DECISIONS).

120 N.J. Super 164, 293 A.2d 450-457 (1972).

Descriptors: "Land use, "Judicial decisions, "Land management, "Drainage, Watersheds, Erosion, Floods, Watercourses (Legal aspects), Sedimentation, Administrative agencies, Land tenure, Drainage engineering, Local governments.

Praimage engineering, Local governments.

Plaintiff lot owner brought action challenging the validity of the tentative approval of a proposed subdivision by defendant, Planning Board and others. Plaintiff's property lies in low elevation of a drainage watershed that includes the subdivision. Plaintiff's object to the subdivision because it cannot be drained adequately and will increase the volume of drainage onto their property thus increasing erosion. Plaintiff's contend that adequate deliberations as to the drainage issue were not included in the Board's decision. Defendants argue that the proposed subdivision can be adequately drained and any protective measures may be created and required at the time final approval is sought. Summary judgment was entered against defendants by the Superior Court of New Jersey, holding that any Planning Board decision must include consideration of drainage as a general condition in any tentative approval under the New Jersey Municipal Planning Act. The court had all matters remanded to the Planning Board for resubmission of evidence as to the adequacy of drainage of the proposed subdivision. (Tolle-Florida)

THE PERIPHERAL CANAL: THE CALIFORNIA MAJORITY VIEW. House, Washington, D.C.

Congressional Record, Vol 118, p E7245-E7246 (daily ed.) August 2, 1972.

Descriptors: "California, "Water quality standards, "Legislation, "Water quality control, "Water supply development, State governments, Local governments, Water conservation, Water polity, Water supply, Water utilization, Water pollution, Water allocation (Policy), Water distribution (Applied), Water storage, Deltas, Land reclamation, Impaired water use, Canals, Water conveyance, Conveyance structures.

Many official and unofficial spokesmen from Con-tra Costa County, California assert that the Peripheral Canal unit of the California State Water tra Costa County, California assert that the Peripheral Canal unit of the California State Water Project is an attempt by Southern California to damage the delta region of Contra Costa County, A member of the California Water Commission, however, points out that the elected officials of Contra Costa Water Agency have so far been responsible for the lack of protection of the Delta environment. Contra Costa County's pumps are sucking up partial saline water in the Delta region. Though this water is below present water quality standards the Agency has issued a brochure indicating that their problems with water quality and land subsidence in the Delta region are solved. The Agency, with no water rights of its own, offers no positive solutions although Contra Costa County's water districts are making substantial planning efforts for the future. Although the County appeared in court to support the decision to implement the recommended water quality standards for the area, it now delays the imposition of these standards by filing of a cross-complaint bringing in the federal government. The County's water agency also opposes any legislation recommending the also opposes any legislation recommending the proposed water quality standards. (Beardsley-Proposed Florida)

SEDIMENT CONTROL BILL (S.3910), Senate, Washington, D.C. J. S. Cooper. Congressional Record, Vol 118, p S13366-S13367 (daily ed.) August 11, 1972.

Descriptors: *Federal Water Pollution Control Act, *Water quality control, *Sedimentation, *Legislation, Water pollution, Water quality, Water Quality Act, Water pollution control, Water pollution sources, Erosion control, Turbidity, Federal government, Legal aspects. Identifiers: *Sediment Control Act.

Identifiers: *Sediment Control Act.

The purpose of the act is to reduce sedimentation from land-disturbing activities consistent with water quality standards. Within a year of the Title's enactment, the Administrator of the Environmental Protection Agency is to issue guidelines for effective control of sedimentation from land-disturbing activities. The guidelines shall include information on effects of uncontrolled sedimentation, techniques for control, and shall specify procedures to be followed by states in establishing control programs. Requirements for state programs include a survey to be conducted within a year of the Title's enactment to determine critical areas of sedimentation resulting in substantial part from activities regulated under the act. Within a year after initial federal guidelines are issued, states are to submit control programs for the problem areas identified in the survey. Federal enforcement includes: (1) the requirement of a permit before federal assistance can be given for activities regulated under the act, (2) required state certification of reasonable assurance of compliance with requirements under the act, (3) authorization to the Administrator of the Environmental Protection Agency to enforce the requirements of state programs, established under the enterpress of state programs, established under the enterpress of state programs, established under the enterpress. authorization to the Administrator of the Environ-mental Protection Agency to enforce the require-ments of state programs established under the act, and (4) federal enforcement of regulations if a state fails to adopt an acceptable program. (Wheeler-Florida) (Wheeler-F W73-01935

ANNUAL REPORT OF THE COUNCIL OF EN-VIRONMENTAL QUALITY, Senate, Washington, D.C. For primary bibliographic entry see Field 06G. W73-01936

THE UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT IN STOCKHOLM, SWEDEN (ENFORCEMENT OF LAW PROHIBITING OIL SPILLS), House, Washington, D.C. For primary bibliographic entry see Field 06G. W73-01937

'GOLDEN ISLES' MAY FIGURE IN WORLD HERITAGE TRUST,
House, Washington, D.C.
G. E. Hagan.
Congressional Record, Vol 118, p E6640-E6641
(daily ed.) June 30, 1972.

Descriptors: "Georgia, "United Nations, "Preservation, "Wetlands, Conservation, Protection, Coasts, Atlantic Coastal Plain, Natural resources, Islands, Aesthetics, Scenery, Wildlife conservation, Ecology.

Identifiers: "Coastal waters.

Identifiers: "Coastal waters.

Later this year the United Nations is expected to establish a World Heritage Trust in Paris that will possibly include such areas as the Grand Canyon, the Amazon River, and other natural and ecologically valuable portions of the earth. This address, which includes a newspaper article, discusses the possibility of Georgia's 'Golden Islea' being included in the Trust. Ecologists and state and federal officials have agreed that Georgia's remaining undeveloped coastal islands, including Ossabaw, Cumberland, Little Cumberland and Sapelo, and Okefenokee Park are among 'the most valuable ecological resources in the world and should be preserved for future generations'. The Georgia section of the Trust would be controlled by Georgians and perhaps administered from an office in Savannah. There would be no loss of legal sovereignty. If the proposal succeeds coastal

Field 06-WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

Georgia could obtain international recognition, and its wildlife and satural areas would remain in-tact for future generations. (Ellis-Florida)

EPA LAUDS DELAWARE'S ANTI-POLLUTION

PROGRAMS, Senate, Washington, D.C.

J. C. Boggs.
Congressional Record, Vol 118, p E6688-E6689 (daily ed.) June 30, 1972.

Descriptors: *Delaware, *Sewage treatment, *Environmental effects, *Political aspects, Grants, Water pollution, Water pollution control, Water water ponuson, water policy, Legislation, Streams, Water quality control, State governments, Governmental interrelations, Costs, Coasts, Sewage.

Identifiers: *Delaware Coastal Zone Act.

While presenting Delaware officials with checks while presenting Delaware officials with checks representing the state's share of several important water pollution control projects, the Region III Environmental Protection Agency administrator said that the state had been a leader and possibly the best in its antipollution efforts. Governor Russell Peterson received special praise for his leadership in such areas as enactment of the Coastal Zone Act, which prohibits heavy industry from Delaware's coast and his efforts to stop sludge Delaware's coast and his efforts to stop sludge dumping almost directly off the Delaware coast. Also specifically noted was the state's Clean Streams Program which calls for the phased fund-ing of all sewage treatment plants in the state, rather than one at a time. Construction of new plants and upgrading of old plants will provide a more advanced form of treatment, so that effluent coming out of the plants will go into state stream at a very high level of cleanliness. (Ellis-Florida) W73-01939

AGRICULTURAL POLLUTION PROBLEMS, House, Washington, D.C.

F. Schwengel. Congressional Record, Vol 118, p E6702-E6703 (daily ed.) June 30, 1972.

Descriptors: *Legislation, *Pollution (Water), *Agricultural watersheds, *Agricultural runoff, Agricultural Agricultural chemicals, Waste disposal, Waste water (Pollution), Sediment octrol, Sediments, Sediment discharge, Sedimentation, Conservation, Watershed management, Watersheds (Basins), Water resources development, Herbicides, Pesticides, Sediments.

Representative Schwengel has introduced a bill, H.R. 155596, to revise the watershed program which calls for specific changes in five major areas, including assistance to farms and ranches. The bill authorizes the Secretary of Agriculture to make agreements for technical, financial, and engineering assistance for up to ten years. The great need for change is evidenced by the present agriculture pollution problem. Agriculture land supplies the greatest amount of the Nation's sediment yield, perhaps over one-half the total. The major sources of agricultural water pollution are sediment, herbicides, pesticides, fertilizers, and livestock wastes. Diseases, which would other-wise die in the soil, are transmitted by sediment and water runoff. These include hog cholera, anthrax, foot-and-mouth disease, brucellosis and antnrax, 1001-and-mouth disease, brucellosis and numerous eye, ear, nose, throat, and skin dis-eases. Sediment also carries several types of chemical pollutants that can not be transported by water alone. Pollution from animal wastes is another problem resulting from technological changes and modern farming techniques. (Ellis-Florida) W73-01940

AN ESSENTIAL NATIONAL PRIORITY: A FULL COMMITMENT AND INVESTMENT NOW IN WATER QUALITY, House, Washington, D.C.

R. A. Roe.
Congressional Record, Vol 118, p E6708-E6709 (daily ed.) June 30, 1972.

Descriptors: "Grants, "Government finance, "Water quality control, "Administrative agencies, Economics, Financing, Federal Water Pollution Control Act, Federal government, Local governments, Atate governments, Administration, Institutional constraints, Political aspects, Water policy, Waste treatment, Political constraints, Legislation, Legal aspects. Identifiers: Environmental Protection Agency, Department of Housing and Urban Development, Economic Development Administration, Farmers' Home Administration.

The national problem of financing needed water and sewer projects presently eligible for federal grants, is analyzed in an article included in the remarks. Four federal agencies currently administer federal water and sewer programs: the Environmental Protection Agency grants funds up to 55% of the total costs to states for allocation to local costs to states for allocation to local costs to states for allocation to local costs of the cost of the mental Protection Agency grants funds up to 55% of the total costs to states for allocation to local governments to construct waste treatment facilities; the Housing and Urban Development Department provides grants to local governments to defer the cost of water and sewer projects; the Economic Development Administration provides grants in areas designated as 'economic redevelopment areas'; and the Farmers' Home Administration offers aid to rural areas. A July 1970 study estimated that public funds needed to control polution amounted to from \$33 to \$37 billion. The four federal agencies have 14,765 pending applications for needed federal-aid grants and loan funding of \$6.8 billion. During fiscal 1971, the Office of Management and Budget allowed the four agencies to obligate only \$1.05 billion. The current proposed fiscal 1972 budget would authorize \$2.6 billion. Congress is called upon to react to the pressing need for funding and to prevent further impoundment of appropriated funds. (Ellis-Florida) W73-01941

MORRIS V. TENNESSEE VALLEY AUTHORI-TY (GOVERNMENTAL LIABILITY FOR DAMAGE DUE TO RESERVOIR LEVEL FLUC-TUATIONS).

345 F. Supp. 321-324 (N.D. Ala. 1972).

Descriptors: *Tennessee Valley Authority, *Judicial decisions, *Reservoirs, *Water level fluctuations, Federal government, Federal project policy, Electric power production, Water pollution, Easements, Legal aspects, Rivers and Harbors Act, Riparian rights, Water rights, Inlets (Waterways), ntifiers: *National Environmental Policy Act.

Plaintiff riparian landowner sought a permanent injunction requiring defendant, Tennessee Valley Authority (TVA), to cleanse sloughs and keep debris from floating on waters of an inlet near plaintiff's property. Defendant operated Wilson Dam and Reservoir as part of a comprehensive system of electrical power production. The resultant fluctuations in water level caused logs, debris, trash and other refuse matter to accumulate in and pollute the sloughs of the inlet where plaintiff's claim was based on nuisance, misuse or overuse of easement late in and pollute the stoughts to the plaintiff's land was located. Plaintiff's claim was based on nuisance, misuse or overuse of easement rights, and violation of the Rivers and Harbors Act and the National Environmental Policy Act (NEPA). The United States District Court, Northern District of Alabama held that actions of the TVA in carrying out its statutory water control functions by creating fluctuations of reservoir levels represent an exercise of discretionary governmental authority that is not subject to judicial review. The court further held such actions did not constitute misuse of easement rights nor viola-tion of the Rivers and Harbors Act nor NEPA. (Nielsen-Florida) W73-01942

6F. Nonstructural Alternatives

USE OF SOIL SURVEYS IN THE IDENTIFICA-TION OF FLOODPLAINS, Soil Conservation Service, Columbus, Ohio. D. E. McCormack. The Ohio Journal of Science, Vol 71, No 6, p 370-375, November 1971. 1 tab, 10 ref.

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Descriptors: "Soil surveys, "Zoning, "Land use, "Planning, "Flood plain zoning, "Geomorphology, "Non-structural alternatives, "River basin development, "Land classification, "Terrain analysis, Flood plains, Floods, Evaluation, Flooding frequency, Mapping surveys, Flood protection, River flow, Rivers, Streams, Regulation, Land

The identification of floodplains is of great importance in land-use planning and in floodplain zoning. Much development is still taking place in flood-prone areas. This is probably due to the inn zonng. Much development is still taking place in flood-prone areas. This is probably due to the inability of most people to recognize the existence and degree of the flooding hazard. The frequency of flooding and depth of flood water on alluvial soils, and soils on stream terraces were evaluated in selected sections of the Great Maim River Valley and tributaries in Montgomery and Preble Counties, Ohio. The boundaries of the highest elevations of flood waters during the floods of 1913 and 1959 were compared to the boundaries of alluvial soils and soils on stream terraces. Essentially all of the alluvial soils were inundated in 1913, but less than ten percentian 1959. It is estimated that the frequency of flooding of alluvial soils is more frequent than once in forty years; and that only the very lowest portions of the terraces are inundated during floods of that frequency. Analysis of the data indicates that soil surveys can be used to delineate those areas where probability of flooding is greatest, and thus where the need for land-use zoning is most urgent to minimize damages due to flooding. (Black-Arizona)

JEFFERSON RIVER AT THREE FORKS, MON-TANA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Omaha, Nebr. For primary bibliographic entry see Field 08D. W73-01903

COMPREHENSIVE BASIN STUDY; RED RIVER BELOW DENISON DAM, ARKANSAS, LOUISIANA, OKLAHOMA, AND TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, New Orleans, La. For primary bibliographic entry see Field 08A.

6G. Ecologic Impact of Water Development

DIOCLIMATIC STUDY OF THE CANARY ARCHIPELAGO, (IN FRENCH), Office de la Recherche Scientifique et Technique Outre-Mer, Cayenne (French Guiana). Centre ORSTOM de Cayenne. For primary bibliographic entry see Field 02B. W73-01370 BIOCLIMATIC STUDY OF THE CANARY

CONTROL OF EURASIAN WATERMILFOIL (MYRIOPHYLLUM SPICATUM L.) IN TVA

Ecologic Impact of Water Development—Group 6G

RESERVOIRS (DRAFT ENVIRONMENTAL IM-RESERVOIRS (DRAFT ENVIRONMENTAL IN-PACT STATEMENT), Tennessee Valley Authority, Chattanooga. Office of Health and Environmental Section. For primary bibliographic entry see Field 05G. W73-01390

EMERGENCY DELIVERY OF COLORADO RIVER WATER TO TIJUANA, BAJA CALIFORNIA, MEXICO VIA FACILITIES IN CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).

International Boundary and Water Commission, El Paso, Tex. For primary bibliographic entry see Field 06E. W73-01391

FOWL RIVER, MOBILE BAY, ALABAMA, NAVIGATION (FINAL ENVIRONMENTAL IM-PACT STATEMENT). Army Engineer District, Mobile, Ala. For primary bibliographic entry see Field 08A.

MIDLAND LOCAL PROTECTION PROJECT, LICKING RIVER, KENTUCKY (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Louisville, Ky. For primary bibliographic entry see Field 08D. W73-01394

CEDAR BAYOU, TEXAS (NAVIGATION) (FINAL ENVIRONMENTAL IMPACT STATE-MENT).
Army Engineer District, Galveston, Tex. For primary bibliographic entry see Field 08A. W73-01395

RAST GREENACRES UNIT, PRAIRIE DIVI-SION, RATHDRUM PRAIRIE PROJECT, IDAHO (FINAL ENVIRONMENTAL IMPACT STATEMENT). Bureau of Reclamation. Boise, Idaho. Region 1. For primary bibliographic entry see Field 08B. W73-01396

BAY MESSION BAY ENTRANCE CHANNEL DREDGING, SAN DIEGO RIVER AND MISSION BAY, SAN DIEGO COUNTY, CALIFORNIA (DRAFT ENVIRONMENTAL IMPACT STATE-MENT).
Army Engineer District, Los Angeles, Calif. For primary bibliographic entry see Field 04A. W73-01397 ENTRANCE CHANNEL

TRED AVON RIVER, TALBOT COUNTY, MARYLAND (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md. For primary bibliographic entry see Field 08H. W73-01398

DALTON RESERVOIR, CONASAUGA RIVER, GEORGIA (DRAFT ENVIRONMENTAL IM-PACT STATEMENT). Army Engineer District, Mobile, Ala. For primary bibliographic entry see Field 08A. W73-01399

ILLINOIS BEACH ACQUISITION, LAKE COUNTY, ILLINOIS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Outdoor Recreation, Ann Arbor, Mich. For primary bibliographic entry see Field 04A.
W73-01400

BOUND BROOK FLOOD CONTROL, SCITU-ATE, MASSACHUSETTS (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Corps of Engineers, Waltham, Mass. New England Div. For primary bibliographic entry see Field 08A. W73-01401

LONG DRAW RESERVOIR ENLARGEMENT PROJECT, COLORADO-AN APPLICATION UNDER THE SMALL RECLAMATION PRO-JECTS ACT FOR WATER SUPPLY AND STORAGE COMPANY (DRAFT ENVIRONMEN-TAL IMPACT STATEMENT). Bureau of Reclamation, Denver, Colo. Region 7. For primary bibliographic entry see Field 08D. W73-01402

HIPES LAKE PROJECT, CRAIG CREEK, VIR-GINIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Norfolk, Va. For primary bibliographic entry see Field 08D. W73-01403

CIBOLO PROJECT, TEXAS (DRAFT ENVIRON-MENTAL IMPACT STATEMENT). Bureau of Reclamation, Amarillo, Tex. Region 5. For primary bibliographic entry see Field 08D. W73-01404

MINNESOTA RIVER, MINNESOTA, MAN-KATO-NORTH MANKATO-LE HILLIER FLOOD CONTROL, PHASE 1 (FINAL EN-VIRONMENTAL STATEMENT). Army Engineer District, St. Paul, Minn. For primary bibliographic entry see Field 08D. W73-01405

REPLACEMENT OF LOCK AND DAM 7 AND LOCK 8, MONONGAHELA RIVER, PENNSYL-VANIA (DRAFT ENVIRONMENTAL IMPACT Army Engineer District, Pittsburgh, Pa. For primary bibliographic entry see Field 08A. W73-01406

CHICOD CREEK WATERSHED, NORTH CAROLINA (DRAFT ENVIRONMENTAL IM-PACT STATEMENT). Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 04D. W73-01407

SEWAGE SLUDGE INCORPORATION IN EX-PERIMENTAL FIELD PLOTS TO EVALUATE HAZARDS AND BENEFITS, AND DEVELOP TECHNIQUES FOR OPTIMIZING BENEFITS AND MINIMIZING HAZARDS (DRAFT EN-VIRONMENTAL STATEMENT). Agricultural Research Service, Washington, D.C. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 05D. W73-01408

MOUNTAIN PARK PROJECT, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATE-MENT). Bureau of Reclamation, Amarillo, Tex. Region 5. For primary bibliographic entry see Field 08A. W73-01409

ST. CATHERINE SOUND, MARYLAND (MAIN-TENANCE DREDGING) (DRAFT ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, Baltimore, Md. For primary bibliographic entry see Field 04A. W73-01411. W73-01411

GENESEE RIVER BASIN STUDY (DRAFT EN-VIRONMENTAL IMPACT STATEMENT).
Great Lakes Basin Commission, Ann Arber. For primary bibliographic entry see Field 08D. W73-01412

PLAQUEMINE LOCK CLOSURE, MISSISSIPPI RIVER AND TRIBUTARIES PROJECT, IBERVILLE PARISH, LOUISIANA (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, New Orleans, La. For primary bibliographic entry see Field 08D. W73-01413

PRICKETT CREEK WATERSHED, WEST VIR-GINIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 04D.

FLAT ROCK CREEK CHANNEL IMPROVE-PLAT ROCK CREEK CHANGEL IMPROVE-MENT (LOCAL FLOOD PROTECTION PRO-JECT) TULSA, OKLAHOMA (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Tulsa, Okla. For primary bibliographic entry see Field 08A. W73-01415

PELICAN BUTTE SPORTS DEVELOPMENT, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT). STATEMENT).
Forest Service (USDA), Portland, Oreg. Pacific
Northwest Region.
For primary bibliographic entry see Field 04A. For primary

ANALYSIS OF BUOYANT JETS WITHIN THE ZONE OF FLOW ESTABLISHMENT, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 05B. W73-01566

ECOLOGICAL CONSIDERATIONS IN REAC-TOR POWER PLANT SITING, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 05C. W73-01568

COLD SPRING INLET, NEW JERSEY (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Philadelphia, Pa. For primary bibliographic entry see Field 08A. W73-01579

NATIONAL HAIL RESEARCH EXPERIMENT (FINAL ENVIRONMENTAL IMPACT STATE-MENT). National Science Foundation, Washington, D.C. For primary bibliographic entry see Field 03B. W73-01580

THE LAW OF THE SEA CONFERENCE-GE-NESIS AND PROSPECT FOR AGREEMENT IN House, Washington, D.C. For primary bibliographic entry see Field 06E. W73-01584

PRESIDENT'S MESSAGE ACCOMPANYING THE REPORT OF THE COUNCIL OF EN-VIRONMENTAL QUALITY, For primary bibliographic entry see Field 06B.

Field 06-WATER RESOURCES PLANNING

Group 6G-Ecologic Impact of Water Development

ENVIRONMENTAL CONCERN AND DEVELOPMENT PLANNING, Ecole Pratique des Hautes Etudes, Paris, (France). For primary bibliographic entry see Field 06B. W77-01664

USING COASTAL ZONE MODELS TO PRE-DICT ENVIRONMENTAL IMPACT, EQ and G, Inc., Waltham, Mass. Environmental Equipment Div. For primary bibliographic entry see Field 05C. W73-01650.

ENVIRONMENTAL FACTORS AFFECTING
THE DISPLACEMENT OF SEA PLOOR INSTALLATIONS,
Naval Civil Engineering Lab., Port Hueneme,
Calif.
Por primary bibliographic entry see Field 08A.
W73-01678

THE BUCKS CREEK PROJECT NO. 619 -CALIFORNIA. (DRAFT ENVIRONMENTAL IM-PACT STATEMENT). Pacific Gas and Electric Co., San Francisco, Calif. For primary bibliographic entry see Field 08C. W73-01705

MYSTIC LAKE RELICENSING, PROJECT NO. 2301 - MONTANA. (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
MONTANA POWER Co., Butte.
For primary bibliographic entry see Field 08C.
W73-01706

RNGINEERING FOR RESOLUTION OF THE ENERGY-ENVIRONMENT DILEMMA: A SUM-MARY. National Academy of Engineering, Washington, D.C. For primary bibliographic entry see Field 05C.

HYDRODYNAMIC CHANGES IN THE CHES-APEAKE BAY, Hampton Roads Sanitation District, Norfolk, Va. For primary bibliographic entry see Field 05C. W73-01730

SEDIMENTATION AND HYDROELECTRIC DEVELOPMENT, Army Engineer District, St. Louis, Mo., Planning Branch. For primary bibliographic entry see Field 05C. W73-01753

THE ECONOMICS OF ENVIRONMENTAL PRESERVATION: A THEORETICAL AND EMPRISICAL ANALYSIS, Resources for the Future, Inc., Washington, D.C. Natural Environments Program.
A. C. Fisher, J. V. Krutilla, and C. J. Ciechetti. The American Economic Review, Vol 62, No 4, p 603-619, September 1972. 1 fig, 3 tab, 27 equa, 32 ref, append.

Descriptors: "Environment, "Preservation, "Natural resources, Water resources development, Economics, "Optimization, Hydroelectric power, Rivers, Mathematical models, Systems analysis, Oregon. Identifiers: "Benefit-cost estimates, "Economic analysis, "Hells Canyon, "Snake River, "Extracconomic considerations, Gorges, Wilderness recreation.

Statistical evidence indicates that environmental costs have risen over time. Although there exists

much literature on benefit-cost criteria for water resource projects, economists have virtually ignored the problem of environmental opportunity costs of natural resources development projects; they have not considered the opportunity returns foregone as a result of destroying natural areas. A modelling technique is presented for the allocation of natural environments between the two broad alternatives of preservation and development. The model is applied to a currently debated issue: 'Should the Hells Canyon of the Saake River, the deepest gorge on the North American continent, be preserved in its current state for wildernass recreation and other activities, or further developed as a hydroelectric facility.' Results show that benefits from development are decreasing over time relative to benefits from preservation. It will not, therefore, be optimal to undertake even the most profitable development project in the Hells Canyon. The area is likely to yield greater benefits if left in its natural state. (Bell-Cornell)

WILL BCOLOGY KILL SMALL BUSINESS, McConkey (Dale D.) Associates, Norwood, Mass For primary bibliographic entry see Field 66C. W73-01796

A NOTE ON ECONOMIC GROWTH AND EN-VIRONMENTAL QUALITY, Australian National Univ., Canberra. For primary bibliographic entry see Field 05G, W73-01809

JEFFERSON RIVER AT THREE FORES, MON-TANA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Omaha, Nebr. For primary bibliographic entry see Field 08D.

SMALL BOAT HARBOR, KING COVE, ALASKA (DRAFT ENVIRONMENTAL IMPACT STATEMERY). Army Engineer District, Anchorage, Alaska. For primary bibliographic entry see Field 08D. W73-01904

ABSECON INLET, NEW JERSEY (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Philadelphia, Pa. For primary bibliographic entry see Field 08A. W73-01905

LAKE FOREST BEACH EROSION, ILLINOIS (FINAL ENVIRONMENTAL IMPACT STATE-MENT). Army Engineer District, Chicago, Ill. For primary bibliographic entry see Field 08A. W73-01906

SECOND POWERHOUSE, BONNEVILLE LOCK AND DAM, COLUMBIA RIVER, OREGON AND WASHINGTON (FINAL ENVIRONMENTAL IM-PACT STATEMENT). Army Engineer District, Portland, Oreg. For primary bibliographic entry see Field 08C. W73-01907

CHINA MEADOWS DAM AND RESERVOIR, LYMAN PROJECT, WYOMING (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Bureau of Reclamation, Salt Lake City, Utah. For primary bibliographic entry see Field 08D. W73-01999 CARPENTER AND REMMEL DEVELOPMENTS (DRAFT ENVIRONMENTAL IMPACT STATE-MENT). Arkansas Power and Light Co., Little Rock. For primary bibliographic entry see Field 08C. W73-01910

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ROYALTON LAKE-SALYERSVILLE AREA, LICKING RIVER BASIN, KENTUCKY (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Louisville, Ky. For primary bibliographic entry see Field 08A. W73-01911

COMPREHENSIVE BASIN STUDY; RED RIVER BELOW DENISON DAM, ARKANSAS, LOUI-SIANA, OKLAHOMA, AND TEXAS (DRAFT ENVERONMENTAL IMPACT STATEMENT). Army Regineer District, New Orleans, La. Por primary bibliographic entry see Field 08A. W73-01912

DEBRIS REMOVAL, NORTH BRANCH CHICAGO RIVER, ILLINOIS (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Chicago, III. For primary bibliographic entry see Field 04A. W73-01913

DEQUEEN LAKE, ROLLING FORK RIVER, ARKANSAS (FINAL ENVIRONMENTAL IMPACT STATEMEN).

Army Engineer District, Tulsa, Okla.

Por primary bibliographic entry see Field 08D.

W73-01914

ROARING RIVER DAM AND RESERVOIR, YADKIN RIVER BASIN, NORTH CAROLINA (DRAFT ENVIRONMENTAL STATEMENT). Army Engineer District, Charleston, S.C. For primary bibliographic entry see Field 08A. W73-01915

RED RIVER OF THE NORTH AT OSLO, MIN-NESOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Regineer District, St. Paul, Minn. For primary bibliographic entry see Field 08A. W73-01917

NATIONAL CENTER FOR TOXICOLOGICAL RESEARCH, PINE BLUFF, ARKANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT). Department of Health, Education and Welfare, Washington, D.C. For primary bibliographic entry see Field 05C. W73-01918

COMPREHENSIVE BASIN STUDY, BIG MUDDY RIVER, ILLINOIS (DRAFT ENVIRON-MENTAL DEPACT STATEMENT). Water Resources Council, Washington, D.C. For primary bibliographic entry see Field 08A. W73-01919

MAINTENANCE DREDGING NOVO RIVER CHANNEL, NOVO HARBOR, MENDOCINO COUNTY, CALIFORNIA (DRAFT ENVIRON-MENTAL IMPACT STATEMENT). Army Engineer District, San Francisco, Calif. For primary bibliographic entry see Field 04A. W73-01920

PERIWINELE CREEK RC AND D PROJECT MEASURE, UPPER WILLAMETTE RC AND D PROJECT, OREGON (DRAFT ENVIRONMEN-TAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 04A. W73-01921

MADDOX V. BRADLEY (NATIONAL EN-VIRONMENTAL POLICY ACT DENIED RETROACTIVE APPLICATION). For primary bibliographic entry see Field 06E. W73-01927

ANNUAL REPORT OF THE COUNCIL OF EN-VIRONMENTAL QUALITY, Senate, Washington, D.C.

Congressional Record, Vol 118, p S13109-S13112 (daily ed.) August 9, 1972.

Descriptors: "Administrative agencies, "Recycling, "Energy, "Environmental effects, Delaware River, Inland waterways, River basins, Legal aspects, Political aspects, Phosphates, Chemical wastes, Nitrogea compounds, Eutrophication, Water quality, Water pollution, Water quality standards.

quality standards. Identifiers: *National Environmental Policy Act, *Council of Environmental Quality.

The Third Annual Report of the Council on Environmental Quality allegedly had three key chapters deleted because they dealt with 'politically sensitive issues'. One chapter dealt with the energy crisis that involved controversial choices between energy demands and environmental protection. Another subject not discussed is effective solid waste management, which will require significantly stepped-up recycling. The third deleted chapter dealt with the management of the Delaware River Basin. The other portions of the report indicate that while the Nation's air is getting cleaner the rivers and waterways are dirtier and the costs of pollution control are going up. Conreport indicate that while the Nation's air is getting cleaner the rivers and waterways are dirtier and the costs of pollution control are going up. Con-centrations of phosphates and nitrogen compound (eutrophication) had increased. (Nielsen-Florida) W73-01936

THE UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT IN STOCKHOLM, SWEDEN (ENFORCEMENT OF LAW PROHIBITING OIL SPILLS), LAW PROHIBITING OIL STILLS), House, Washington, D.C. G. Gude. Congressional Record, Vol 118, p E6482-E6485 (daily ed.) June 27, 1972.

Descriptors: *United Nations, *International commissions, *Environmental control, *Water pollution control, Conferences, International waters, Federal government, Oil pollution, Legislation, Water law, Legal aspects, Governments, Oil, Oceans, Water supply, Water quality, Water pollution, Water policy, DDT, Administrative agencies, United States, Water Quality Act.

cies, United States, Water Quality Act.

Matters relating to the Conference on the Human Environment, and the enforcement of the 1970 Water Quality Improvement Act are discussed. The Act, which prohibits oil discharges by vessels in the contiguous zone, will be enforced by the Coast Guard. Representative Gude stressed the immediate need for the United States to take positive steps in the area of petroleum transport in international and national waters. Included are statements by Canadian officials stressing the urgency of the oil discharge problem in the Puget Sound area. The United States led the Conference by announcing the banning of DDT, urging an international whaling moratorium, working for the protection of all genetic resources, and proposing the establishment of a World Heritage Trust. International environmental problems of the developing countries are stressed in a statement by the Economic Community of Africa. Among the more significant recommendations resulting from the convention were those designed: to facilitate completion in 1972 of an international convention to restrict ocean dumping; to improve water

supply and sewage in rapidly growing cities of developing countries; and to create in the United Nations a permanent, high level environmental unit. (Ellis-Florida) W73-01937

'GOLDEN ISLES' MAY FIGURE IN WORLD HERITAGE TRUST,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-01938

FORMER CAMP PARKS SEWAGE DISPOSAL PLANT, PARCEL A-2, PLEASANTON, CALIFORNIA (DRAFT ENVIRONMENTAL IM-PACT STATEMENT).
General Services Administration, Washington,

For primary bibliographic entry see Field 05D. W73-01943

WALKER DAM IMPOUNDMENT, AQUATIC PLANT CONTROL PROJECT, NEW KENT COUNTY, VIRGINIA (DRAFT ENVIRONMEN-TAL IMPACT STATEMENT). Army Engineer District, Norfolk, Va. For primary bibliographic entry see Field 05G. W73-01944

POLLUTION PRINCIPLES/WATER POLLU-TION AND SEWAGE DISPOSAL, For primary bibliographic entry see Field 05D. W73-01945

NAVAL AIR STATION, LEMOORE, CALIFOR-NIA; SEWAGE DISPOSAL FACILITY (LAND ACQUISITION) (FINAL ENVIRONMENTAL IM-PACT STATEMENT). Department of the Navy, Washington, D.C. For primary bibliographic entry see Field 05D. W73-01946

TUALATIN PROJECT, OREGON (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Bureau of Reclamation, Boise, Idaho. Reg For primary bibliographic entry see Field 08D. W73-01947

GULF INTRACOASTAL WATERWAY, MER-MENTAU RIVER, LOUISIANA (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, New Orleans, La. For primary bibliographic entry see Field 08A. W73-01948

CRUDE OIL AND NATURAL GAS PRODUC-TION IN NAVIGABLE WATERS ALONG THE TEXAS COAST (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 05G.

W73-01949

NEWHALEM CREEK PROJECT, WASHING-TON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Seattle Dept. of Lighting, Wash. For primary bibliographic entry see Field 08C.

W73-01950

07. RESOURCES DATA

7B. Data Acquisition

TEMPERATURE MEASUREMENTS GROUND AND WATER SURFACES BY AIR-

CRAFT,
D. Lorenz.
Available from NTIS, Springfield, Va 22151—N7217270; Price \$3.00 paper copy; 95 cents microfiche. National Aeronautics and Space Administration Technical Translation NASA TT F14140, February 1972. 32 p, 11 fig, 5 tab, 6 ref.
Trans. of Temperaturmessunger von Bodea-und Wasseroberflacher von Luffahrzeuger aus. Pure and Applied Geophysics, Basel, Vol 67, p 197-220, 1967.

Descriptors: *Water temperature, *Soil tempera-ture, *Measurement, *Remote sensing, *Infrared radiation, Aerial photography, Analytical techniques, Data collections, Photogrammetry, In-strumentation.

Measurements of ground and water surfaces are described using two different models of Infrared radiometers, the Infrared Thermometer 1 (IT-1) and the Portable Radiation Thermometer 4 (PRT-4), made by Barnes Engineering Company, Stanford, Conn. Sea-temperature measurements obford, Conn. Sea-temperature measurements obtained by the IT-1 agreed well with the measurements of water temperature made by lightships, while they differed considerably from those made by coastal stations. Measurements of different types of surfaces indicated a strong influence exerted by the type of surface, particularly if covered with vegetation. Measurements made at an angle between 30 and 45 deg. to the horizontal yielded results which were not as dependent on the nature of the surface as were perpendicular measurements. Most of the studies were performed with the IT-1 which uses a semiconductor bolometer of very low inertia as the radiation detector. The spectral sensitivity of the instrument is the same as that of the PRT-4. (Woodard-USGS) W73-01298

AN EXAMINATION OF APPLICATIONS OF REMOTE SENSING DATA TO METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS' PLANNING REQUIRE-Metropolitan Washington Council of Governments, D. C.
For primary bibliographic entry see Field 03E.
W73-01299

ILLINOIS RADAR RESEARCH FOR HAIL SUP-PRESSION APPLICATIONS, 1967-1969, Illinois State Water Survey, Urbana. S. A. Changnon, Jr.
Illinois Water Survey Report of Investigation 71,
1972. 23 p, 24 fig, 12 tab, 37 ref.

Descriptors: "Hail, "Weather forecasting, "Radar, "Illinois, Methodology, Clouds, Aircraft, Remote sensing, Meteorology, Data collections, Storms. Identifiers: "Hailstorm echo detection, Hail pai-

Two 3-cm radars, a CPS-9 operated during 1967 in a pseudo-CAPPI fashion and a TPS-10 (RHI) operated in 1967-69, were used with very dense surface hail networks in Illinois to investigate a variety of radar applications to potential hail suppression activities. The areal extent of hail during a given precipitation period can be estimated in a study area from the areal extent of the highest half-order of reflectivity for the day. Hail-producing echoes could be identified on a given day if the echoes fulfilled three or more of five criteria, relative to the echo characteristics on a given day. The criteria were that the echoes (1) were in the taller

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haif of the first echoes; (2) had above average first echo depths, top to base; (3) had above average reflectivities at first echo; (4) grew more than 3000 feet; and (5) existed more than 20 minutes. The relationship of first echo characteristics with evenrelationship of first echo characteristics with eventual halistorms indicates that conditions leading to halistorm development are rooted often in the initial phases of a cloud development. Complete 3-dimensional radar reflectivity scanning must be accomplished over a study area in 2 minutes or less to identify halistorms and to measure surface hail areas with 3-cm radar. (Woodard-USGS) W73-01300

PRINCIPLES AND MEASURING TECHNIQUES OF TURBULENCE CHARACTERISTICS IN OPEN-CHANNEL FLOWS, Geological Survey, Bay St. Louis, Miss. For primary bibliographic entry see Field 08B. W73-01304

FIELD PERFORMANCE AND EVALUATION OF TWO AUTOMATIC SUSPENDED SEDI-MENT PUMPING SAMPLERS, Agricultural Research Service, Oxford, Miss. Sedimentation Lab. For primary bibliographic entry see Field 02J.

THE APPLICATION OF REMOTE SENSING TECHNIQUES FOR DATA COLLECTION ON THE MISSISSIPPI RIVER, Army Engineer District, Vicksburg, Miss. River Stabilization Branch.
P. C. Harris.

In: Proceedings of Mississippi Water Resources Conference, April 11-12, 1972; Mississippi Water Resources Research Institute Publication, p 101-111, 1972. 3 fig, 3 ref.

Descriptors: "Aerial photography, "Remote sensing, "Photogrammetry, "Terrain analysis, Mississippi River, Infrared radiation, Streamflow, Channel morphology, Mapping, Erosion, Scour, Sediment transport, Water temperature, Path of

A feasibility study was made of using remote sensing techniques to gather data from the Missis-sippi River. Color infrared photography is as good supp RIVET. CORD INTERFED PROTOGRAPHY IS AS good or better than any other format used. Color infrared photography is particularly useful for penetrating light haze found in humid regions; consequently good high altitude photographs can be taken. Remote sensing techniques can define the degree of dynamic changes and could give indications of potential troublesome reaches. Particular manhasis was placed or recording and interpreting emphasis was placed on recording and interpreting imagery of: flow patterns, suspended sediment distribution, surficial sediment deposits and ero sion patterns, potential earthside areas along the banks, vegetation (type and extent), soil type and moisture content on the flood plain and banks and in the levees, water depth effects, bedform ef-fects, effect of mannade structures on the flow fects, effect of manmade structures on the flow and sedimentation patterns, temperature patterns at the surface of the water, direct water depth determinations, suspended-sediment concentration measurements, and the general ecology of the study reaches. To describe the geometry pertaining to the characteristic shapes found in a river channel, measurements made were radius of bends, shape of middle, point and alternate bars, shape of bank erosion and volume estimates of erosion and sedimentation processes; water surface flow patterns; water surface slopes; flow velocities from floating debris; areal size and distribution of eddies; and channel widths. (See also W73-01317) (Knapp-USGS) W73-01322

USE OF SUGAR FLOTATION AND DYE TO USE. OF SUGAR FLOTATION AND DYE TO SORT BENTHIC SAMPLES, Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology. R. T. Lackey, and B. E. May. Transactions of American Fisheries Society, Vol 100, No 4, p 794-797, October 1971. 2 tab, 17 ref.

Descriptors: *Marking techniques, *Benthic fau-na, *Flotation, Sampling. Identifiers: *Chaoborus, *Lumbriculus, Formalin.

Identifiers: *Chaoborus, *Lumbriculus, Formalin.
Benthic sampling procedures generally have two inherent problems: time consumed and accuracy. In order to determine an efficient procedure for accurate field testing seven different treatments were tested on near homogeneous Ekman dredged benthic samples from depths of 4 and ten meters. Live picking proved to be a good method, but not the most efficient for recovering small or transparent invertebrates. The six other treatments were preservation in nature, with the rose-bengal-formalin solution (0.1 g rose-bengal added to 1 liter 10% formalin) proving most efficient in estimating the number of Lumbriculus. Timewise, rose-bengal formalin treatment was not significantly faster, but did yield many organisms per time unit. Light-green formalin and malachite green formalin hastened recovery of Chaoborus and the larger Lumbriculus as compared to formalin, but were ineffective in recovering the smaller Lumbriculus. It was concluded that a solution of rose bengal and formalin was a good all around preservative, prior to sugar flotation. (Anderson-Texas)

MEASURING THE CHANGE IN THICKNESS OF THE ANTARCTIC ICE SHEET, Bristol Univ. (England). Dept. of Physics. For primary bibliographic entry see Field 02C. W73-01499

HYDROGEOLOGIC AND ENGINEERING-GEOLOGIC POSSIBILITIES FOR EMPLOY-ING THE METHOD OF INDUCED POTEN-TIALS, Moscow State Univ. (USSR). For primary bibliographic entry see Field 02F. W73-01500

LYSIMETER DESIGNS FOR STUDY OF LEACHING OF SALINE SOILS (KONSTRUKT-SII LIZIMETROV DLYA IZUCHENIYA PRO-MYVOK ZASOLENNYKH POCHV), Vsesoyuznyi Nauchno-Issledovatel skii Institut Gidrotekhniki i Melioratsii, Moscow (USSR). A. K. Levkovskiy.
Pochvovedeniye, No 2, p 144-147, February 1972.

Descriptors: *Instrumentation, *Analytical techniques, *Lysimeters, *Leaching, *Saline soils, Soil types, Drainage, Flow rates. Identifiers: *USSR, *Soil samples, Soil monoliths, Drainage modulus.

New polyethylene-film and concrete lysimeters with an undisturbed soil sample and regulated drainage flow are described, diagrammed, and compared. Best results were obtained using flow rates of about 0.3 liter/sec/ha with 2-m and 3-m deep concrete lysimeters measuring 1 x 1 m and 1 x 2 m in plan and sealed with tar. (Josefson-USGS) W73-01516

USE OF SATELLITE NAVIGATION FOR INDI-CATIONS OF EQUATORIAL SURFACE CUR-Scripps Institution of Oceanography, La Jolla, Calif.

Caur. A. W. Mantyla. Journal of Geophysical Research, Vol 77, No 30, p 6021-6024, October 20, 1972. 3 fig, 1 tab, 11 ref. NSF Grants GB12413 and GX28162.

Descriptors: *Ocean currents, *Ocean circulation, *Pacific Ocean, *Navigation, *Satellites (Artificial), Data collections, Mapping, Surveys, Instrumentation, Oceanography.

Identifiers: *Satellite navigation equipment.

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On the Climax 2 expedition between Hawaii and Tahiti, satellite navigation fixes were used to estimate the set of the ship from its dead reckoning positions as an indication of surface currents. Comparisons were then made between these estimated currents and historical equatorial current measurement data. The satellite-derived currents were found to be particularly useful in pinpointing current-countercurrent regions and for observing zones of divergence and convergence. (Knapp-USGS) USGS) W73-01739

A NONCOHERENT MODEL FOR MICROWAVE EMISSIONS AND BACKSCATTERING FROM THE SEA SURFACE, Kansas Univ., Lawrence. Space Technology

Laos. S. T. Wu, and A. K. Fung. Journal of Geophysical Research, Vol 77, No 30, p 5917-5929, October 20, 1972. 8 fig, 24 ref. NASA Contract NAS 1-10048.

Descriptors: "Water temperature, "Wave (Water), "Microwaves, "Remote sensing, "Radiwaves, Electromagnetic radiation, Model studies Mathematical models, Instrumentation, Statistics. Identifiers: "Microwave emission (Oceans).

Identifiers: "Microwave emission (Oceans).

The two-scale (small irregularities superimposed on large undulations) scattering theory was extended and used to compute the microwave apparent temperature and the backscattering cross section from ocean surfaces. The effect of the small irregularities on the scattering characteristics of the large undulations is included by modifying the Fresnel reflection coefficients, and the effects of the large undulations on those of the small irregularities are accounted for by averaging the scattering cross sections of the small irregularities over the surface normals of the large undulations. The same set of surface parameters in the assumed scattering model is employed at a given wind speed to predict both the scattering and the emission characteristics for both polarizations. Much improved performance over a single-surface theory is demonstrated. A scattering model is better when it is used to predict both the scattering and the emission characteristics. (Knapp-USGS) W73-01748

A TECHNIQUE FOR COLLECTION OF PAR-TICULATE ORGANIC MATTER IN SITU, Rhode Island Univ., Kingston. Graduate School of Oceanography.
N. Marnhall, J. Parrish, and A. L. Gall.
Mar Biol (Berlin). Vol 12, No 3, p 194-195. 1972.
Identifiers: "Collection techniques, "Filter devices, Mill'Collection techniques," Farticulate devices, Millipore filter, Monitoring, "Particulate organic matter.

A technique is described for concentrating and collecting particulate organic matter from water with minimal disturbance. This involves exposing in situ the surface of a Millipore filter monitor mounted on a simple vacuum flask assembly.—Copyright 1972, Biological Abstracts, Inc. W73-01869

7C. Evaluation, Processing and Publication

DELAWARE NATURAL RESOURCES INVEN-TORY, WITH SELECTED REFERENCES. Delaware State Planning Office, Dover.

Available from NTIS, Springfield, Va 22151, PB-208 558, Price \$3.00 paper copy; 95 cents microfiche. December 1970. 72 p, 8 fig, 23 tab.

Descriptors: "Reviews, "Natural resources, "Census, "Delaware, "Bibliographies, Water resources, Climates, Forests, Geology, Agriculture, Soils, Mineralogy, Wetlands, Publications.

This inventory and related bibliographies provide a general description of Delaware's natural resources. Information and data are included on the State's climate, agricultural land, forests, geology, mineral resources, soils, water resources, and wetlands. (Woodard-USGS) W73-01227

SUMMARY OF TURBULENCE DATA FROM RIVERS, CONVEYANCE CHANNELS AND LABORATORY FLUMES, Geological Survey, Bay St. Louis, Miss. For primary bibliographic entry see Field 08B. W73-01305

TRANSIENT FLOW, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 08B. W73-01309

DEPTH TO WATER TABLE, HARTFORD NORTH QUADRANGLE, CONNECTICUT, Geological Survey, Washington, D.C. E.H. Handman.
Available from USGS, Washington, D C 20242Price 75 cents. Geological Survey Miscellaneous Geologic Investigations Map 1-784 L, 1972. 1 sheet, 1 map, 2 ref.

Descriptors: "Water table, "Depth, "Maps, "Con-necticut, Water levels, Groundwater, Hydrogeolo-gy, Hydrologic data, Sounding, Tides. Identifiers: Mean low water, Mean high water.

This map, scale 1:24,000, shows depths to water table in Hartford North quadrangle, Connecticut. Depth to water below the land surface is based on data collected during different months of several different years. Nowhere in the map area has the depth to water been significantly affected by large-scale pumping. The water level fluctuates seasonally; it is closest to the land surface during the late winter and early spring and is deepest in late summer and fall. The amount of fluctuation denends on topography, type of saturated earth depends on topography, type of saturated earth material, the depth of the bedrock surface, and yearly distribution of precipitation. (Woodard-USGS) W73-01312

FLOODS OF AUGUST AND SEPTEMBER 1971 IN NEW JERSEY, Geological Survey, Trenton, N.J. For primary bibliographic entry see Field 02E. W73-01314

REPRESENTATIONS OF RAINFALL AND RU-NOFF BY THE DESCENDING EXPONENTIAL, Agricultural Research Service, Oxford, Miss. Sedimentation Lab.

Sedimentation Lao.
D.A. Parsons.
In: Proceedings of Mississippi Water Resources
Conference, April 11-12, 1972; Mississippi Water
Resources Research Institute Publication, p 57-76,
1972. 4 fig, 6 tab, 20 ref.

Descriptors: "Statistical methods, "Hydrologic data, "Variability, "Rainfall, "Runoff, Distribu-tion patterns, Frequency analysis, Time series analysis.

Generally satisfactory representations of the distributions of magnitude of discrete rainfall and runoff events are provided by the descending exponential function. A family of distribution functions, called the 'Distribution of the largest,' adequately portrays the distributions of largest items to occur in given time periods. The skewness

of these functions varies from the extreme of the exponential function to the moderate value of the extreme value function. The incomplete gamma function is used to represent sums of rainfall or runoff events, for example, annual values of rainfall and runoff. The descending exponential, the distribution of the largest, and the incomplete gamma function are consistent, and the latter two are derivable from the first. (See also W73-01317) (K-napp-USGS)
W73-01321

WATER RESOURCES INVESTIGATIONS IN TEXAS, 1972. Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1972. 5 fig. 1 map.

Descriptors: *Water resources, *Investigations, *Texas, *Inter-agency cooperation, Groundwater, Surface waters, Surveys, Planning, Hydrologic data, Basic data collections, Precipitation (Atmospheric), Streamflow, Sediment transport, Water temperature, On-site investigations, Water wells, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps. Identifiers: *Cooperative water-studies program, Research projects. Research projects.

The water resources studies and investigations of the U.S. Geological Survey in Texas are summarized. A selected bibliography is included of material concerning the State. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 886 surface water stations; 1,283 groundwater observation wells; and 367 water quality observing sites. Small State maps show principal sources of groundwater, average precipitation, discharge of the principal rivers, dissolved solids in ground and surface waters, and the status of groundwater studies. A map, scale 50 mile to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Texas in January 1972. (Woodard-USGS)

COMPUTER-ASSISTED GAS CHROMATOG-

RAPHY, Purdue Univ., Lafayette, Ind. R. S. Swingle, II. Available from Univ. Microfilms, Inc., Ann Arbor, Mich., 48106 Order No. 72-1948. Ph. D. Thesis, 1971, p 204.

Descriptors: "Gas chromatography, "Digital computers, "Instrumentation, "Automation, "Data processing, "Data storage and retrieval, Computers, Computer programs, Equipment, Adsorption, Automatic control. Identifiers: On-line gas chromatographs, Precision, Data interpretation, On-line systems, Retentions times.

Both off-line and on-line computer configurations were developed to provide precise chromatographic data. A digital programmer was constructed which synchronized data acquisition with sample injection for a high-precision gas chromatograph. The instrument was used to determine differential thermodynamic quantities of two gasliquid systems. Individual alpha values and consequently delta (delta H degrees) were determined with a precision of plus or minus 0.02 percent. The precision in the measurement of delta (delta Gegrees) was plus or minus 0.2 cal/mole. These values represented an order of magnitude improvement over the best previously reported data. Heats of adsorption of hydrocarbons on carbon black and silica gel were also determined with a precision of plus or minus 0.6 percent. An on-line gas chromatograph provided for computer control of sample injection, column temperature, and flow

rate, plus direct computer readout of inlet pressure, mass flow rate, and detector response. Data processing yielded, in real-time, a standard deviation of less than plus or minus 0.05 percent in retention time, which was comparable to previous results obtained using an off-line computer. However, corrected retention volumes determined in real-time had a standard deviation of about 0.4 percent which reflected primarily the uncertainty in flow measurement. The on-line instrument was also applied to an optimization study of conditions for minimal analysis time. Estimations of resolution appeared to be better than present theory would lead one to expect. (Holoman-Battelle) would lead W73-01440

THERMAL SPRINGS OF THE WESTERN UNITED STATES.

Paradise Publishers, Santa Barbara, California, W. C., Kaysing, compiler and editor, 1970. 36 p.

Descriptors: "Thermal springs, "Hot springs, "United States, "Geographical regions, Indexing, Locating, "Data collections, Water temperature, Water utilization, Hydrogeology, Documentation. Identifiers: "Western United States.

This catalog lists thermal springs in the Western United States by name (if any), number, and geographical location. Data for each spring include water temperature, flow rate in gallons per minute, the associated rocks, references on chemical quality, use of water, and remarks. Hot springs, as they are usually called, are distributed throughout the world. They are most numerous in areas in which there has been volcanic activity in late geologic time. The Western United States is such an area and contains more than 90% of all the hot geologic time. The Western United States is such an area and contains more than 90% of all the hot springs in America. In the U.S., only those springs are called thermal whose temperatures are at least 15 F above the mean annual temperature of the air in their localities. (Woodard-USOS) W73-01439

WATER RESOURCES INVESTIGATIONS IN CONNECTICUT, 1972. Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1972. 5 fig. 1 map.

Descriptors: "Water resources, "Investigations, "Connecticut, "Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data colections, Groundwater, Streamflow, Lakes, Reservoirs, Precipitation (Aimospheric), On-site investigations, Water quality, Water level fluctuations, Bibliographies, Networks, Maps. Identifiers: "Cooperative water-studies program, Persearch projects Research projects.

The water resources studies and investigations of the U. S. Geological Survey in Connecticut are summarized. A selected bibliography of material concerning the State is included. The investigations program consists of the collection of basic information through a hydrologic data network, areal hydrologic interpretive studies, and research projects. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 227 surface water stations; 26 groundwater observation wells; and 19 surface water and 4 groundwater quality observing sites. Small State maps show principal sources of groundwater, discharge of the principal rivers, average annual precipitation, and average annual runoff. A map, scale 9 mile to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Connecticut in June 1972. (Woodard-USGS)

Field 07—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

GUIDE TO USERS OF GROUND WATER IN GUIDE TO USERS OF GROUND WATER IN BAY COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla. J. B. Foster. Florida Bureau of Geology Map Series, No 46, 1972. 1 sheet, 9 fig, 5 ref.

Descriptors: "Groundwater resources, "Water wells, "Aquifer characteristics, "Water quality, "Florida, Well data, Water yield, Pumping, Withdrawal, Chemical analysis, Salinity, Water ta-ble, Water level fluctuations, Groundwater recharge, Water utilization, Maps. Identifiers: "Bay County (Fla).

Identifiers: *Bay County (Fla).

This atlas provides information to Bay County, Florida, home owners, well drillers, and others who are interested in obtaining water from wells. The atlas can be used to determine the approximate depth to the top of the vater-bearing limestone (the Floridan aquifer) and to determine the minimum length of casing required for a well tapping the limestone. The approximate thickness of limestone that must be penetrated by a well to assure an adequate yield, the location of water of good quality, the yield of a well, the dissolved solids and selected minerals in the water, and the types of rocks generally penetrated also can be estimated. The water-table aquifer is composed of sand and gravel with sandy clay lenses. Its thickness is variable up to 140 feet along the coast. Water levels range from 3 to 65 feet below land surface. Six-inch-diameter wells may supply as much as 150 gpm. The Springfield area, the only area of large water use in Bay County, has 12 industrial wells (8 to 18 inches in diameter) tapping gravel beds of the water-table aquifer, which yield from 190 to 400 gpm each. Water from the area adjacent to the bays and the Gulf is not potable; chloride content is as much as 1,400 mg/liter. (Woodard-USGS)

HYDROGRAPH ROUTING IN OPEN CHAN-NELS, Minnesota Univ., Minneapolis. For primary bibliographic entry see Field 08B. W73-01503

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 14. PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN.
Geological Survey, Washington, D.C.

Available from Sup Doc, GPO, Washington, DC 20402 - Price \$4.25. Geological Survey Water-Supply Paper 2135, 1972. 1,036 p, 1 fig.

Descriptors: *Hydrologic data, *Surface waters, *Pacific Northwest U.S., *Oregon, *Columbia River, Data collections, Streamflow, Flow measurement, Stream gages, Flow rates, Average flow, Low flow, Peak discharge, Lakes, Reser-voirs, Water levels, Crest-stage gages. Identifiers: *Lower Columbia River basin.

This volume of surface water data for the Pacific Slope basins in Oregon and Lower Columbia River basin is one of a series of 37 reports presenting records of stage, discharge, and content of streams, lakes, and reservoirs in the United States during the 1966-70 water years. The tables of data include a description of the gaging station, and daily, monthly, and yearly discharges of the stream. The description of the station gives the location, drainage area, records available, type and history of gage, average discharge, extremes of discharge, and general remarks. For most gaging stations on lakes and reservoirs, a description of the station and a monthly summary table of stage and contents are given. Data for partial-record stations include measurements at low-flow partial-record stations and annual maximum stage and discharge at crest-stage stations. (Woodard-USGS)

TIDAL CURRENT TABLES, 1972, ATLANTIC COAST OF NORTH AMERICA. National Ocean Survey, Rockville, Md.

Available from the National Technical Informa-tion Service as COM-71-50603, \$3.00 in paper copy, \$0.95 in microfiche. 1971. 200 p, 5 tab.

Descriptors: *Tides, *Currents (Water), *Atlantic Ocean, *North America, *Hydrologic data, Tidal waters, Diurnal, Time, Navigation, Ships, Tidal streams, Estuaries, Coasts, Inlets (Waterways), Velocity. Identifiers: *High tides, *Low tides, Slack water.

Tables give the predicted times of slack water and the predicted times and velocities of maximum current-flood and ebb-for each day of the year (1972) at a number of stations on the Atlantic coast from the Bay of Fundy, Canada to Vieques Passage, Puerto Rico. The times are given in hours and minutes and the velocities in knots. The columns headed 'Slack water' contain the predicted times at which there is no current; or, the times at which the current has stopped in a given direction and is about to begin in the opposite direction. Offshore, where the current is rotary, slack water denotes the time of minimum current. (Woodard-USGS)
W73-01506 (Woodard-1 W73-01506

ICE SHELVES OF ANTARCTICA (SHEL'-FOVYYE LEDNIKI ANTARKTIDY), Arkticheskii i Antarkticheskii Nauchno-Iss-ledovatelskii Institut, Leningrad (USSR). For primary bibliographic entry see Field 02C. W73-01520

ANNUAL COMPILATION AND ANALYSIS OF ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE BRYAN, TEXAS METROPOLITAN AREA, 1970, Geological Survey, Austin, Tex. F. H. Tovar. Geological Survey Data Report, August 1972. 43 p,

1 fig. 1 tab.

Descriptors: "Urban hydrology, Rainfall-runoff relationships, "Streamflow, "Discharge measurement, "Texas, Flow rates, "Hydrologic data, "Data collections, Storms, Peak discharge, Hydrographs, Mass curves, Urban runoff, Urbanization. Identifiers: "Bryan (Tex).

Basic hydrologic data collected during the 1970 water year (Oct. 1, 1969 to Sept. 30, 1970) are presented for the Burton Creek and Hudson Creek presented for the Burton Creek and Hudson Creek watersbeds in Bryan, Texas. Average rainfall over the Burton Creek watershed during the water year was 41.52 inches, or 6% more than the 30-year (1931-60) average of 39.12 inches for Brenham (25 miles south of the study area). Mean daily discharge was 2.20 cfs, and the total runoff was 1,590 acre-feet, or 22.41 inches (54% of rainfall). Average rainfall over the Hudson Creek watershed during the water year was 44.32 inches, or 13% more than the 30-year (1931-60) average of 39.12 inches for Brenham. Mean daily discharge was 1.49 cfs, and the total runoff was 1,080 acre-feet, or 10.45 inches (24% of rainfall). Rainfall-runoff data for storms are tabulated. Computations with hydrographs and mass curves for each storm are included. (Woodard-USGS)

COMPUTER SIMULATION MODEL OF DYNAMIC BIO-PHYSICO-CHEMICAL PROCESSES IN SOILS, Arizona Univ., Tucson. Dept. of Soils, Water and neering. rimary bibliographic entry see Field 05B.

08. ENGINEERING WORKS

THERMAL PLUMES IN LAKES: COMPILA-TIONS OF FIELD EXPERIENCE, Argonne National Lab., III. Center for Environ-mental Studies. For primary bibliographic entry see Field 05B. W73-01709

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8A. Structures

EVALUATION OF FLARED OUTLET TRANSI-TIONS; HYDRAULIC MODEL INVESTIGA-

Army Engineer Waterways Experiment Station,

Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Div. B. P. Fletcher, and J. L. Grace, Jr. Sponsored by Office, Chief of Engineers, U.S. Army. U.S. Army Engineer Waterways Experiment Station, Research Report H-72-1, June 1972. 7 p, 1 tab, 5 photo, 3 pl.

Descriptors: *Outlets, *Hydraulic models, *Culverts, Discharge (Water), Tailwater. Identifiers: *Outlet transitions.

Model tests of outlet transitions.

Model tests of outlet transitions consisting of various lengths and elevations of horizontal aprons with sidewalls flared one on eight were conducted to determine the maximum limiting discharges for which satisfactory performance could be maintained with various conditions of tailwater. Results are presented in dimensionless parameters and design charts for ready determination of (a) the maximum discharges perminsible with a given diameter culvert, given lengths of flared outlet transitions, and various depths of tailwater, and (b) the lengths of flared outlet transition required for a given diameter culvert, a given discharge, and various depths of tailwater. This type of protection is considered effective for those outlets subject to various tailwaters, provided the discharges are relatively small, and for the usual range of discharges, provided sufficient and reladischarges are readvery amin, and of the usual range of discharges, provided sufficient and rela-tively large tailwater depths will exist downstream. (Fletcher-WES) W73-01381

PERTINENT DATA ON SPILLWAY TAINTER GATES FOR CORPS OF ENGINEERS PRO-

Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Div. R. G. Cox.

Sponsored by Office, Chief of Engineers, U.S. Army. U.S. Army Engineer Waterways Experi-ment Station, Miscellaneous Paper H-72-7, June 1972. 1 p. 1 fig. 1 tab, 1 app.

Descriptors: *Radial gates, *Spillway gates. Identifiers: *Gate opening practices.

Spillway tainter gates of the Corps of Engineers are classified according to whether they are mounted on round or flat crests or at channel inrecurrence on round or rist crests or at channel inverts. Pertinent data concerning the gates, crest forms, and gate opening practices are given in tabular form. Small-scale cross sections of the gated structures are included. (Cox-WES) W73-01383

FOWL RIVER, MOBILE BAY, ALABAMA, NAVIGATION (FINAL ENVIRONMENTAL IM-PACT STATEMENT). Army Engineer District, Mobile, Ala.

Available from the National Technical Informa-tion Service as PB-206 639-F, \$3.00 in paper, \$0.95 in microfiche. October 8, 1971. 36 p, 1 map.

Descriptors: "Navigation, "Alabama, "Environmental effects, "Dredging, Navigable waters, Navigable rivers, Recreation, Commercial shellinth, Shrimp, Aquatic life, Water sports, Boating, Turbidity, Silting, Wildlife habitats, Sedimentation, Spoil banks, Commercial fishing, Bays. Identifiers: "Environmental Impact Statements, "Mobile Bay (Ala), "Fowl River (Ala).

*Mobile Bay (Ala), *Fowl River (Ala).

The proposed project will provide for a new channel from the Mobile Bay Ship Channel, Mobile County, Alabama, into and up Fowl River to natural deep water. Channelization will be by hydraulic dredge. Spoil from river dredging will be placed on designated land areas along the bank while spoil from bay dredging will be placed in open water. The proposed project will satisfy the need for improved navigation facilities in Fowl River to be used by commercial shrimping and recreational boating interests. Adverse effects will be those typical of many dredging operations: increased siltation and turbidity near the point of discharge. This impact will be highly localized and temporary. The filling of 30 acres of high marsh will limit use of these areas by small mammals and birds. Alternatives include no action, placement of spoil on fast land and channelization at different depths. No action would forfeit the benefits cited. Fast land placement of all dredged material would reduce the benefit-cost ratio. (Nielsen-Florida) W73-01393

CEDAR BAYOU, TEXAS (NAVIGATION) (FINAL ENVIRONMENTAL IMPACT STATE-MENT).

Army Engineer District, Galveston, Tex.

Available from the National Technical Informa-tion Service as EIS-TX-72-4557-F, \$4.25 in paper copy, \$0.95 in microfiche. January 4, 1972. 40 p, 1

Descriptors: "Channel improvement, "Texas, "Environmental effects, "Dredging, Channels, Transportation, Construction, Canal construction, Navigation, Channeling, Excavation, Navigable waters, Bayous, Spoil banks, Wildlife habitats, Safety, Economic impact, Community development, Turbidity, Tidal marshes, Inland waterways, Waterfowl, Disposal, Water pollution sources, Ships.

Identifiers: "Environmental Impact Statements, "Cedar Bayou (Tex), "Galveston Bay (Tex).

*Cedar Bayou (Tex), *Galveston Bay (Tex).

The project involves the completion of a navigation project consisting of a 2.3 mile, 10 foot by 100 foot, navigation channel in Cedar Bayou and relocation of an 0.8 mile section of the existing project channel in Galveston Bay. Approximately 610,000 cubic yards of material will be dredged and disposed of largely in diked disposal areas. The work will improve the navigation alignment from the bay into the mouth of the bayou affecting a savings in transportation costs and reduction in marine accidents probability. The improvement may induce some acceleration of the industrialization rate of the lower bayou. Adverse effects include: permanent loss of the 9.4 acres of tidal marsh and land area to be excavated; temporary localized increases in water turbidity in the lower reaches of Cedar Bayou and in northwestern Galveston Bay through the hydraulic dredging; and covering of about 120 acres of high marsh by deposition of excavated materials in disposal areas resulting in temporary displacement of some birds and small animals. Alternatives considered include no action and various alternate construction methods. Comments from interested agencies are included. (Ellis-Florida) W73-01395 W73-01395

DALTON RESERVOIR, CONASAUGA RIVER, GEORGIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Mobile, Ala.

Available from the National Technical Informa-tion Service as EIS-GA-72-4578-D, \$3.00 in paper copy, \$0.95 in microfiche. May 1972. 4 p.

Descriptors: "Georgia, "Environmental effects, "Multiple-purpose reservoirs, "Flood control, Water quality control, Recreation facilities, Fish conservation, Rivers, Reservoirs, Earth dams, Water supply development, Water supply, River regulation, Water control, Wildlife habitats, Spillaway gates, Impoundments, Water management (Applied), Water resources development, Flood-Way good, Water resources development, Photo-ing. Identifiers: *Environmental Impact Statements, *Conasauga River (Georgia).

This proposed improvement consists of a multiple purpose reservoir on the Conasagua River in Whifield and Murray Counties, Georgia, located about aix miles aoutheast of the city of Dalton. Major features of the project include a gated spillway structure flanked by concrete non-overflow sections tied to high ground by earthen dams and a reservoir with a total storage capacity of about 186,000 acre-feet. The project will meet most of the area's needs for flood control, water supply, downstream water quality control, water supply, downstream water quality control of fish and wildlife values. A base for sustained development of its textile-oriented industrial economy will also be provided by the project. Adverse effects include provided by the project. Adverse effects include loss of about 19 miles of a stream fish habitat, loss of about 19 miles of a stream tiss insuran, which is of low value due to intermittent stream flow, and inundation of about 17,500 acres of mixed agricultural and wooded wildlife habitats. Alternatives considered include reservoirs at other sites, stream diversions, development of ground water, and no action. (Ellis-Florida) W73-01399

BOUND BROOK FLOOD CONTROL, SCITU-ATE, MASSACHUSETTS (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Army Corps of Engineers, Waltham, Mass. New England Div.

Available from the National Technical Informa-tion Service as EIS-MA-72-4566-F, \$3.25 in paper copy, \$0.95 in microfiche. May 1972. 16 p, 1 map.

Descriptors: *Massachusetts, *Flood protection, Descriptors: "Massachusetts, "Flood protection, "Channel improvement, "Environmental effects, Flood control, Floods, Bank stability, Channels, Slope stability, Stream improvement, Stream sta-bilization, Economic impact, Social aspects, Water management (Applied), Vegetation, Excavation.

Identifiers: *Environmental Impact Statements,

*Scituate (Mass).

This proposed plan of flood protection for Scituate, Massachusetts, consists of the following improvements along Bound Brook: channel realignment and widening, removal of accumulated snags ment and widening, removal of accumulated snags and debris, excavation of rock outcrops, and restoping and regrading of the banks with excavated materials. The snagging and clearing along Bound Brook will prevent future flooding in the commercial center of North Scituate and will provide a high degree of protection. Protection of the residential and commercial areas will encourage future development and growth. There will be a loss of some trees and other ground vegetation during construction. The results of the project will serve to improve the existing environmental and ecological conditions of the waterabed. Alternatives considered include retention of natural valley storage or upstream reservoir storage and alternatives rorage or upstream reservoir storage and alternatives. storage or upstream reservoir storage and altera-tions to the existing outlet works at Hunters Pond, were considered. Comments from interested agen-cies are included. (Ellis-Florida) W73-01401

REPLACEMENT OF LOCK AND DAM 7 AND LOCK 8, MONONGAHELA RIVER, PENNSYL-

VANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Pittsburgh, Pa.

Available from the National Technical Informa-tion Service as PB-208 297-D, \$3.00 in paper copy, \$0.95 in microfiche. November 9, 1970. 10 p, 1

Descriptors: "Pennsylvania, "Dam construction, "Locks, "Navigation, Rivers and Harbors Act, Dams, Rivers, Damsites, Construction, Navigable rivers, Navigable waters, Coal mine wastes, Engineering structures, Channels, Channel improvement, Hydraulic structures, Flow control, Gates, Turbidity, Sedimentation. Identifiers: "Environmental Impact Statements, "Monongahela River (Pa).

*Monongahela River (Pa).

This action involves the replacement of Lock and Dam 7 and Lock 8 on the Monongahela River in Fayette and Green Counties, Pennsylvania. Since the present locks are old and increasingly more costly to repair, they will be replaced with larger, modern locks. Dam 7 will be replaced by a fixed crest dam with an attendant pool raise upstream from the existing facility. Since coal mining and related activities have profoundly affected the socioeconomic conditions of the area, the Monongahela River has low aesthetic qualities, decreased vegetation cover, soil ensoin and pollution. The environmental impacts of the proposed action are a pool level increase of 15 feet extending 2.8 miles along the River, improvement of navigation facilities, and incentives for construction of growth of waterway user industries. Adverse environmental effects include an increase in turbidity and sedimentation resulting from construction activities. Other environmental changes are not expected to have adverse effects on existing environmental quality. Alternatives to the porposed project in which centered the control of the set Dean 7 states the results. nave adverse effects on existing environmental quality. Alternatives to the porposed project include: replacement of Lock and Dam 7 at another location; changes in the level of pool 7, and no action. The proposed plan requires the least alteration of the existing environment. (Crow-Florida)

MOUNTAIN PARK PROJECT, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATE-

u of Reclamation, Amarillo, Tex. Region 5.

Available from the National Technical Informa-tion Service as PB-207 728, \$3.00 in paper copy, \$0.95 in microfiche. March 27, 1972. 45 p, 1 map.

Descriptors: "Oklahoma, "Reservoir construction, "Environmental effects, "Multiple-purpose projects, Reservoir storage, Water supply, Reservoirs, Water sources, Reservoir sites, Reservoir design, Dams, Damsites, Arch dams, Concrete dams, Canal construction, Canals, Water storage, Water utilization, Relocation, Wildlife habitats,

Identifiers: *Environmental Impact Statements, *Mountain Park Project (Oklahoma).

The proposed project in Mountain Park, Oklahoma, involves construction of a thin-arch concrete dam on Otter Creek, a diversion dam on Elk Creek, a 10.8 mile diversion canal to convey flows from Elk Creek into Otter Creek, pipelines to deliver municipal and industrial water to Altus and Snyder, and relocating short reaches of railroad and highway grades. The project will provide a dependable water supply for municipal and industrial use, flood control, recreational opportunities, and enhancement of fish and wildlife habitating the area. Adverse environmental effects in ties, and enhancement of fish and wildlife habitat in the area. Adverse environmental effects include: inundation of 9,280 acres by the reservoir; the loss of fish and wildlife habitat in the 27-mile stretch of Otter Creek below the dam after 50 years of project operation; and highway and homestead relocations. Alternatives include: (1) use groundwater in he lunderlying area, (2) use groundwater in neighboring Tillman County, (3)

Field 08-ENGINEERING WORKS

Group 8A—Structures

importation of water from other areas, (4) use other surface sources and reservoir sites, (5) no project, and (6) management of existing supplies. (Wheeler-Florida) W73-01409

PRICKETT CREEK WATERSHED, WEST VIR-GINIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 04D. W73-01414

FLAT ROCK CREEK CHANNEL IMPROVE-MENT (LOCAL FLOOD PROTECTION PRO-JECT) TULSA, OKLAHOMA (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Tulsa, Okla.

Available from the National Technical Informa-tion Service as PB-208 471-F, \$3.00 in paper copy, \$0.95 in microfiche. February 4, 1972. 24 p, 1 map,

Descriptors: *Oklahoma, *Channel improvement, *Environmental effects, *Dredging, Flood protection, Levees, Floods, Flood routing, Flood plains, Reservoirs, Banks, Beds, Channeling, Channels, Flood control.
Identifiers: *Environmental Impact Statements,

*Flat Rock Creek (Okla).

*Flat Rock Creek (Okla).

The proposed project consists of channel straightening and enlargement of about 7,400 feet of Flat Rock Creek and approximately 4,500 feet of its tributary, Valley View Creek in Tulsa County, Oklahoma. Along Flat Rock Creek the improvement will consist of 1,000 feet of earth channel in the upper reach with 1 on 2.5 riprap side alopes, followed by 6,100 feet of earth channel with 1 on 2.5 quarry run stone bank protection. Bottom width of the channel will vary from 55 feet to 70 feet. Valley View Creek will be concrete lined with side slopes of 1 on 1.5 upstream of Iroquis Avenue and 1 on 2.5 downstream to Flat Rock Creek. Channel bottom width will vary from 30 feet to 40 feet. The project will result in flood control against a 100-year frequency flood and create an opportunity for increased land use. Adverse environmental effects include: displacement of one residence; relocation of some pipelines, telephone and power lines, and sanitary and storm sewers; some clearing of vegetation; scarring of the landscape from construction; and loss of 38 acres of land for the right-of-way. Alternatives include: no action, flood diversion, levees, reservoir-channel improvement (Wheeler-Florida)
W73-01415 tion, and Florida) W73-01415

REDUCING AND RETARDING VOLUME AND VELOCITY OF A LIQUID FREE-FLOWING IN ONE DIRECTION, Tecnico, Inc., Washington, D.C. (assignee) G. V. De Lizasoain.
U. S. Patent No 3,667,234, 3 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 899, No 1, p 48, June 6, 1972.

Descriptors: *Patents, *Estuaries, Surges, *Engineering structures, Saline water-fresh water interfaces, Water control, Floodgates, Control structures, Floodways.
Identifiers: *Salt water intrusion.

A method and system are provided for retarding salt water intrusion into fresh water outlets that are subject to salt water tidal flow. Part of the volume of inflowing salt water is diverted into secondary channels wherein its flow is increased in velocity and linearized in direction. Then it may be caused to flow back into the remainder of the stream at an angle of incidence that will cause tur-

bulence drag and other fluid phenomena which will act in opposition to the flow of the stream thereby reducing its velocity and slowing its up-stream travel while the tide is rising to its peak. (Sinha-OEIS) W73-01542

APPARATUS FOR REMOVING OIL SPILLS FROM THE SURFACE OF A BODY OF WATER, Hercules Inc., Wilmington, Del. (assignee). For primary bibliographic entry see Field 05G. W73-01545

COLD SPRING INLET, NEW JERSEY (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Philadelphia, Pa.

Available from the National Technical Informa-tion Service as PB-208 466-D, \$3.00 in paper copy, \$0.95 in microfiche. February 1, 1972. 9 p, 1 map.

Descriptors: *Dredging, *Channel improvement, *Navigation, *Environmental effects, Channels, Channeling, Transportation, New Jersey, Inlets (Waterways), Inland waterways, Harbors, Disposal, Maintenance, Excavation.

Identifiers: *Environmental Impact Statements, *Cold Spring Inlet (NJ).

The proposed project for the maintenance of the 2-1/4 mile inlet channel located in Cape May County, New Jersey, includes periodic dredging of the channel and maintenance of jetties. Dredged material will be deposited offshore in the Atlantic Ocean. The project will provide a safe channel for commercial and recreational vessels by decreasing chances of vessel damage by grounding or collision. Flushing action, which inhibits pollution, will be aided. The project will not result in any significant adverse effects although temporary turbidity will occur during dredging. Alternatives are alternate disposal methods or suspension or termination of maintenance. (Wheeler-Florida) W73-01579

IN SUPPORT OF FLOOD CONTROL, House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-01582

ENVIRONMENTAL FACTORS AFFECTING THE DISPLACEMENT OF SEA FLOOR IN-STALLATIONS, Naval Civil Engineering Lab., Port Hueneme,

Caur.
K. R. Demars, and D. G. Anderson.
Naval Civil Engineering Laboratory Technical Report No. R-744, October 1971.

Descriptors: *Environmental effects, *Ocean currents, *Sedimentation, Earthquakes. Identifiers: *Underwater structure, *Underwater vehicles, *Ocean bottom, *Seafloor installations.

Purpose is to evaluate potential environmental problems at a seafloor site. Problems of concern are earthquake occurrence and effects, slope stability, turbidity currents, sediment scour adeposition, and seafloor vehicle trafficability. Pertinent information on each is presented including an evaluation of the magnitude, probability of occurrence, and effects on seafloor installations. General information is presented on the seafloor environment including the geomorphology, bottom currents, and sediments. Guidelines are recommended for evaluating each problem area. Also given are specific recommendations for certain construction sites to be avoided. Another factor is that struction sites to be avoided. Another factor is that struction sites to be avoided. Another factor is that struction sites to be avoided. Another factor is that struction sites to be avoided. Another factor is that struction sites to be avoided. Another factor is that struction sites to be avoided. Another factor is that struction sites to be avoided. The track and the wheel appear to be the most promis-

ing running gear for seafloor vehicles. Includes 7-page bibliography. W73-01678

STRUCTURAL SAFETY-A LITERATURE REVIEW.

American Society of Civil Engineers, New York.

Task Committee on Structural Safety.

Journal of the Structural Division, American Society of Civil Engineers, Vol 98, No ST4, p 845-884, Apr 1972. 1 fig, 362 ref, append.

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Descriptors: "Bibliographies, "Probability, *Safety, "Structural analysis, "Structural en-gineering, Construction, Dynamics, Safety fac-tors, Load distribution, Building codes, Reliabili-ty, Strength, Loads (Forces), Dead loads, Design, Reviews. Identifiers: Random vibration theory, Live loads

This literature review and bibliography provides a guide for structural engineers in studying the problems of structural safety. The review is divided into 5 sections: (1) load analysis; (2) strength analysis; (3) dynamic structural analysis; (4) structural reliability analysis; and (5) design aspects. Although a background in probability is not necessary to benefit from reading this review, some knowledge of elementary theory of probability and statistics would be helpful. The bibliography provides a wide choice of references in English; however, no attempt was made to make an exhaustive review. In spite of efforts to include the more significant publications, unavoidably, some major papers may have been omitted. (USBR)

HYDRAULIC MODEL STUDIES OF THE CANAL STRUCTURES ADJACENT TO BACON SIPHON AND TUNNEL, COLUMBIA BASIN PROJECT, WASHINGTON, Bureau of Reclamation, Denver, Colo. G. L. Beichley. Bureau of Reclamation Report REC-ERC-72-22, July 1972. 29 p. 25 fig. 1 ref.

Descriptors: *Siphons, *Canals, *Hydraulic models, Mannings equation, Model studies, Cross-sections, Roughness coefficient, Standing waves, Waves, Velocity distribution, Transition flow, Outlets, Washington, Flow characteristics, Canal design, *Hydraulic design. Identifiers: *Wave suppressors, Bifurcations, Columbia Basin Project (Washington).

A 1:49.8 scale model was used to aid development of design modifications to increase the capacity of the Main Canal near Grand Coulee Dam in Washington. Portal-to-canal transitions with wave suppressors were developed for the tunnels from the 2 siphons. Flow characteristics in the canals upstream and downstream of the siphons and tunnels were studied to develop designs for the bifurcation and the canal junction, and to determine the proper cross-sectional size of the canals. (USBR) W73-01779

PA MONG STAGE ONE FEASIBILITY RE-PORT, APPENDIX V, PLANS AND ESTI-MATES, VOLUME 2. Bureau of Reclamation, Washington, D.C. For primary bibliographic entry see Field 06C. W73-01803

BREAKWATER.

R. Scholl.
U. S. Patent No. 3,595,026, 3 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 888, No 4, p 1113, July 27, 1971.

Descriptors: *Patents, *Shore protection, *Break-waters, Coasts, *Waves (Water), Ocean waves, *Beach erosion, Beaches, *Coastal structures.

This breakwater has elements arranged side by side with a lateral space between so that part of an oncoming wave can pass between them. These elements may have a U-shaped horizontal cross section. The elements may have an arcuately curved vertical cross section to divert the oncoming wave upward and back upon itself. (Sinha-OEIS) W73-01840

ABSECON INLET, NEW JERSEY (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Philadelphia, Pa.

Available from the National Technical Informa-tion Service as PB-208 377-D, \$3.00 in paper copy, \$0.95 in microfiche. February 1, 1972. 9 p, 1 map.

Descriptors: "New Jersey, "Dredging, "Channel improvement, "Environmental effects, Channels, Channeling, Transportation, Harbors, Inland waterways, Navigation, Oceans, Water pollution sources, Operation and maintenance, Ships, Spoil banks, Disposal, Identifiers: "Environmental Impact Statements, "Absecon Inlet (New Jersey).

*Absecon Intet (New Jersey).

The proposed project for the maintenance of the inlet channel in Atlantic County, New Jersey, consists of periodic dredging of 1.5 miles of the channel and depositing the dredged material offshore in the Atlantic Ocean. The inland entrance channel will be 20 feet deep at mean low water and 400 feet wide, and the entrance channel from the inlet channel into Clam Creek will be 15 feet deep and 200 feet wide. Approximately 190,000 cubic yards of uapolluted sand and silt will removed and deposited offshore as close to shore as is practical to allow for deposit on nearby beaches by drift. The project will provide a safe channel for commercial and recreational vessels by decreasing chances of vessel damages caused by grounding or collision. No significant adverse environmental effects are expected other than temporary turbidity during dredging. Alternatives are: (1) termination of maintenance dredging, (2) use onshore disposal, and (3) alternate disposal areas. (Wheeler-Florida) W73-01905

LAKE FOREST BEACH EROSION, ILLINOIS (FINAL ENVIRONMENTAL IMPACT STATE-MENT). Army Engineer District, Chicago, III.

Available from the National Technical Informa-tion Service as PB-204 663-F, \$3.00 in paper copy, \$0.95 in microfiche. January 1972. 29 p.

Descriptors: *Illinois, *Erosion control, *Beach recosion, "Environmental effects, Groins (Structures), Wind erosion, Geomorphology, Storms, Waves (Water), Parks, Beaches, Recreation, Geological history, Accretion, Lakes, Currents (Water). ntifiers: *Environmental Impact Statements,

*Lake Forest (III).

*Lake Forest (III).

The project involves the extension of existing still groins along the Lake Michigan shoreline of Lake Forest, Illinois. The project is designed to help prevent further erosion, stabilize existing beaches, and restore eroded and damaged public beaches along the Illinois shore of Lake Michigan. The project will replace one 30 foot groin and extend it 80 feet and extend another groin 140 feet. The adverse effects of the project will involve modification of the littoral drift, geological processes, waves, and storms upon the shoreline. The adverse effect upon downdrift areas will be minimized by limiting the length of the groins to form an even curve thus allowing material to drift across and around the structures after the beach conforms to the silhouette of the groins. Alternative means of shore protection available included (1) artificial beach fill or nourishment; (2) structures such as bulkheads, seawalls, and revetments which reduce or prevent erosion; and (3) structures.

tures such as groins which provide protection by intercepting part of the granular material moving along the shore by currents. The advantages and disadvantages of each alternative protection method are evaluated. (Chavis-Florida) W73-01906

SECOND POWERHOUSE, BONNEVILLE LOCK AND DAM, COLUMBIA RIVER, OREGON AND WASHINGTON (FINAL ENVIRONMENTAL IM-PACT STATEMENT). Army Engineer District, Portland, Oreg. For primary bibliographic entry see Field 08C.

ROYALTON LAKE-SALYERSVILLE AREA, LICKING RIVER BASIN, KENTUCKY (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Louisville, Ky.

Available from the National Technical Informa-tion Service as EIS-KY-72-4571-D, \$3.00 in paper copy, \$0.95 in microfiche. May 1972. 6 p.

Descriptors: "Kentucky, "Environmental effects, "Dam construction, "Reservoir construction, Multiple-purpose reservoirs, Water storage, Earth dams, Flood control, Diversion structures, Flood protection, Water storage, Watershed management, Community development, Aquatic habitat, Channel improvement, Land management, Water supply, Low flow augmentation, Recreation. Identifiers: "Environmental Impact Statements, "Licking River Basin (Ky).

The proposed project is located in the Appalachian region of Kentucky near the town of Salversville, 269 miles upstream from the confluence of the Licking River with the Ohio River. The proposed action is a five element plan consisting of a multiple-purpose dam and reservoir near Royalton, Kentucky; channel improvements on the Licking River; 3 upstream flood control structures in 3 forks of the Licking River; flood protection land treatment measures within the watershed; and an industrial, commercial and residential plan for the Salversville area. The plan will convert 8, 700 acres Salyersville area. The plan will convert 8,700 acres from private to public use. Of the 8,700 acres 1,350 acres of woodland will be lost due to the construcacres or woodland will be lost due to the construc-tion of the reservoir. Portions of the free flowing water aquatic habitat will be converted to slack water habitat. The flood protection, water supply, low flow augmentation and recreation provided by the proposed action will improve the region's quality of life and encourage the area's develop-ment. Alternative dam sites considered are not as feasible as the proposed project site. (Beardsley-Florida) W73-01911

COMPREHENSIVE BASIN STUDY; RED RIVER COMPREHENSIVE BASIN STUDT; RED RIVER BELOW DENISON DAM, ARKANSAS, LOUI-SIANA, OKLAHOMA, AND TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, New Orleans, La.

Available from the National Technical Informa-tion Service as PB-208 876-D, \$3.00 in paper copy, \$0.95 in microfiche. March 1972. 104 p, 5 tab.

Descriptors: *Environmental effects, *Optimum Descriptors: "Environmental effects, "Optimum development plans, "River basin development, "Southwest U.S., Resources development, Water resources development, Comprehensive planning, Basins, Flood control, Drainage systems, Land management, Potential water supply, River basins, Flood plani zoning, Flood protection, Water supply, Water quality, Recreation, Navigation, Wildlife habitats, Irrigation, Arkansas, Louisiana, Oklahoma, Texas. Identifiers: "Environmental Impact Statements, "Red River Basin."

This project involves a study of the problems and potentialities of the land and water resources of the Red River Basin below Denison Dam located in Arkansas, Louisians, Oklahoma, and Texas. A proposed early action plan will satisfy needs for additional flood protection, water supply, water quality, recreation, fish and wildlife, navigation, and hydroelectric capacity; a long-range plan will permit full development of the area's resources. Implementation of the programs will meet water supply needs of the area to the year 2080. The structural flood control measures will provide protection to about 1.1 million acres of flood plain land. Adverse effects of the project will include: loss of wildlife habitats and use of productive lands at lake locations; alteration of the Red River from a free flowing stream to a series of lakes or pools in the navigation improvement area; and water quality degradation of the Red River by increased unfoldify during construction with a loss of aquatic life. Alternatives considered include combinations of lakes for flood control, lakes and channel improvement measures, and foregoing active (Eliki-Riocide). nent measures, and foregoing ac-W73-01912

ROARING RIVER DAM AND RESERVOIR, YADKIN RIVER BASIN, NORTH CAROLINA (DRAFT ENVIRONMENTAL STATEMENT). Army Engineer District, Charleston, S.C.

Available from the National Technical Informa-tion Service as EIS-NC-72-4576-D, \$3.00 in paper copy, \$0.95 in microfiche. May 1972. 7 p.

Descriptors: "North Carolina, "Environmental effects, "Multiple-purpose reservoirs, Multiple-purpose projects, Flood control, Flood protection, Water supply, Water supply development, Water quality control, Recreation, Recreation demand, Recreation facilities, Wildlife habitats, Economic impact, Fisheries, Aquatic habitats, Streams, Reservoirs, Reservoir fisheries. Identifiers: "Environmental Impact Statements, "Roaring River Dam and Reservoir (NC).

This project would involve the construction of a multiple-purpose reservoir on Roaring River, in Wilkes County, North Carolina, located about 25 miles west of Winston-Salem. The reservoir will provide storage for flood control, water supply, water quality control, an 831 acre lack with related developments for outdoor recreation opportunities, and stimulate economic development in the area. The proposed project will greatly reduce urban flood damage in the Elkin-Jonesville area, meet the water supply and water quality control needs of the area until the year 2020, and provide water-oriented outdoor recreation opportunities. Adverse environmental effects would include loss of about 9.5 miles of stream fishery habitat, loss of about 9.5 miles of stream fishery habitat, loss of about 4.200 acres of lands with low to moderate wildlife populations, and displacement of 24 families. Alternatives considered include flood plain zoning and flood warning systems, local flood protection works, flood proofing, and evacuation of the flood plain. (Ellis-Florida) This project would involve the construction of a

RED RIVER OF THE NORTH AT OSLO, MIN-NESOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, St. Paul, Minn.

Available from the National Technical Informa-tion Service as PB-204 943-F, \$3.00 in paper copy, \$0.95 in microfiche. October 21, 1971. 34 p, 2 map.

Descriptors: "Minnesota, "Environmental effects, *Flood protection, "Levees, Check structures, Flood coatrol, River regulation, Rivers, Flood plains, Floodproofing, Water management (Applied), Roads, Vegetation, Aesthetics, Drainage, Drainage systems.
Identifiers: "Environmental Impact Statem
*Red River of the North (Minn), Oslo (Minn).

Field 08-ENGINEERING WORKS

Group 8A-Structures

This flood protection project would involve the improvement of an existing levee system and construction of interior drainage facilities and street and road ramps at Oslo, Minnesota. The project will have a beneficial impact on the area's environment by affording protection against a standard project flood. Changes to surrounding plant and animal life would be limited since the original ecology of the area has already been altered by agricultural and urban development. However, portions of the natural floodplain will be committed to levee widening requiring removal of existing vegetation. Adverse environmental effects include the loss of natural floodplain and the restriction of access and view of the river channel from riverbank properties along the flood barrier reach. Alternatives considered include foregoing action, permanent evacuation of the floodplain and land use zoning, and floodproofing existing structures in the floodplain. Comments of various federal, state, and local agencies are included. (Ellis-Florida) W73-01917 W73-01917

COMPREHENSIVE BASIN STUDY, BIG MUDDY RIVER, ILLINOIS (DRAFT ENVIRON-MENTAL IMPACT STATEMENT). Water Resources Council, Washington, D.C.

Available from the National Technical Informa-tion Service as PB-207 415-D, \$3.00 in paper copy, \$0.95 in microfiche. March 10, 1972. 18 p, 1 tab.

Descriptors: *Environmental effects, *Watershed (Basins), *River basin development, *Land development, Future planning (Projected), Waste water (Pollution), Multiple-purpose reservoirs, Stream fisheries, Land use, Fish guiding, Wildlife habitats, Recreation, Flow augmentation, Flow

control.

Identifiers: *Environmental Impact Statements,
*Big Muddy River (III).

The early action program for the Big Muddy River Basin, located in southwestern Illinois, proposes the construction of reservoirs, establishment of Batin, located in southwestern Illinois, proposes the construction of reservoirs, establishment of recreational-environment corridors, and land treatment measures. The reservoirs will enhance the low flow stream regimen, augment the natural low flow in the river thereby having a beneficial effect on stream fishery, and allow the river to support a warm water fishery. The streams will act so natural filter beds for agricultural effinents and silt loads. The recreation-environmental corridors will encourage the conservation of varied absints. The only unavoidable adverse environmental effect would be the displacement or harming of resident species of wildlife due to the construction of the multiple-purpose reservoirs. Considered as alternatives were waste water treatment plants and alternatives were waste water treatment plants and alternatives were waste water treatment plants and efficient to administer. The only irrevocable use of resources would be the land inundated as a result of reservoir construction and use. (Reed-Florida)

PERIWINKLE CREEK RC AND D PROJECT MEASURE, UPPER WILLAMETTE RC AND D PROJECT, OREGON (DRAFT ENVIRONMEN-TAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 04A. W73-01921

GULF INTRACOASTAL WATERWAY, MER-MENTAU RIVER, LOUISIANA (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, New Orleans, La.

Available from the National Technical Informa-tion Service as PB-200 776-D, \$3.00 in paper copy, \$0.95 in microfiche. March 1971. 16 p, 1 map.

Descriptors: *Environmental effects, *Naviga-tion, *Channel improvement, *Dredging, Loui-siana, Channeling, Disposal, Biota, Turbidity, Silt-ing, Transportation, Channels, Excavation, Wil-diffe habitats, Bridge construction, Spoil banks,

Pipelines.
Identifiers: *Bnvironmental Impact Statements,
*Mermentau River (La).

*Mermentau River (La).

The proposed project in Cameron, Vermillion, Jeferson Davis and Acadia Parishes, Louisiana, consists of the realignment and improvement of existing navigation channels with an accumulative length of 43 miles, to provide depths of 12 feet. The Louisiana State Highway 14 bridge at Lake Arthur will be replaced. Two 26-inch pipelines, one 6-inch pipeline, and one 4-inch pipeline will be relocated. The project will improve commercial navigation conditions and will result in increased industrial and agricultural development of the area. The adverse environmental impact will be the permanent or long term loss of approximately 2,000 acres of marsh and bottomland hardwoods, now used as wildlife habitat, due to channel and spoil right-of-way. Temporary turbidity and sittation will occur during construction. The alternatives are no action, improvement of the existing channel without realignment, or use of a bucket dredge in lieu of hydraulic dredges. (Wheeler-Florida)

W73-01948

8B. Hydraulics

INVENTORY Y REPORT-COLUMBIA-NORTH REGION, WASHINGTON AND PACIFIC OREGON.
Corps of Engineers, Portland, Oreg. North Pacific

Available from NTIS, Springfield, Va. 22151, as AD-730 342; Price \$3.00 paper copy; 95 cents microfiche. National Shoreline Study, August 1971. 80 p, 12 fig, 10 photo, 46 plate, 11 tab.

Descriptors: "Shore protection, "Beach erosion, "Census, "Washington, "Oregon, Coasts, Pacific Northwest U.S., Pacific Ocean, Investigations, Reviews, Data collections, Planning, Projects, Federal government, Shores, Coastal engineering, Coastal structures, Storms, Tides, Environmental effects, Land development, Recreation, Shoals, Shoreline cover, Berms, Bays, Estuaries, Navigation

Identifiers: *National shoreline study, Regional in-

ventory.

In 1968, the 90th Congress authorized National appraisal of shore crosion and shore protection needs. The National Shoreline study is broken into three classes: Shore Erosion Inventories; Shore Protection Guidelines; and Shore Management Guidelines. A separate report has been prepared for each of these classes. This report on shore erosion presents an inventory of the physical characteristics, historical changes, and ownership and use of the coastal shorelines of the States of Washington and Oregon, including major bays and estuaries. The historic changes studied relate to crosion produced by wave and tidal phenomenon. Maximum use was made of aerial photographs, existing Federal, State and county information and maps, existing reports and materials on file in the Seattle and Portland Districts of the Corps of Engineers, and shoreline data compiled for the Comprehensive Study of Water and Related Land Resources-Puget Sound and Adjacent Waters. (Woodard-USGS)

HYDRAULIC TESTS IN HOLE UAE-6H, AMCHITKA ISLAND, ALASKA, Geological Survey, Lakewood, Colo. W. C. Ballance.

Available from NTIS, Springfield, Va 22151USGS-474-104; Price \$3.00 paper copy; 95 cents microfiche. Geological Survey Report USGS-474-104 (Amchitka-13), October 1972. 31 p,

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Descriptors: "Test wells, "Construction, "Hydrologic aspects, "Hydraulic gradient, "Water sampling, Alaska, Methodology, Water wells, Testing, Transmissivity, Water quality, Aquifer characteristics. Identifiers: "Amchitka Island (Alaska).

Data are presented on well construction and hydraulic testing to satisfy the needs for information to interpret the hydrologic system of Amchitical Island, and to obtain water samples for chemical and radiochemical analysis. Inflatable straddle packers were used to isolate and test 14 intervals ranging from 39 to 258 m (127 to 846 ft) each in the test hole. Static water levels in the intervals ranged from 23 m below land surface in the upper intervals to about 90 m in the lower intervals, indicating decreasing head with depth. Specific capacity of the test hole from 85 to 2,134 m (279 to 7,000 ft) was 1.94 cu m per day per m (0.11 gal/min/ft) of trawdown after the hole had been jetted at an average rate of 60 gpm for 23 hr. Transmissivity was 0.60 cu m per day per meter (48.3 gpd/ft). (Lang-USGS)

PRINCIPLES AND MEASURING TECHNIQUES PRINCIPLES AND MEASURING TECHNIQUES OF TURBULENCE CHARACTERISTICS IN OPEN-CHANNEL FLOWS, Geological Survey, Bay St. Louis, Miss. R. S. McQuivey. Geological Survey Open-file Report, July 1972. 207 p. 32 fig. 3 tab, 19 ref, append.

Descriptors: "Fluid mechanics, "Turbulent flow, "Flow measurement, "Anemometers, "Flow characteristics, Analytical techniques, Open chan-nel flow, Instrumentation, Mathematical studies, Equations, Velocity, Temperature, Density, Viscosity, Pressure, Slopes.
Identifiers: "Hot-film anemometry.

Turbulent velocity fluctuations in open-channel shear flows strongly influence a large number of fluid mechanics phenomena. The statistical turbulence characteristics that best describe the structure of the flow field and their relation to the equations of the structure of the flow field and their relation to the equations of the structure of the flow field and their relation to the equations of the structure of the structure of the flow field and their relation to the equations of the structure of the structur ture of the flow field and their relation to the equa-tions of motion and the energy equation are presented. A detailed description of the instrumen-tation is included along with a discussion of calibration characteristics, heat-transfer relations, comparison between hot-film and hot-wire mea-surements and possible sources of errors in turbusurements and possible sources or errors in turbulence measurements. A procedure is explained to circumvent contamination problems so that measurements can be made in natural rivers and streams. Aspects of analog and digital data reduction are discussed. (See also W73-01305) W73-01304

SUMMARY OF TURBULENCE DATA FROM RIVERS, CONVEYANCE CHANNELS AND LABORATORY FLUMES, Geological Survey, Bay St. Louis, Miss. R. S. McQuivey. Geological Survey Open-file Report, July 1972. 195 p. 40 fig, 18 tab, 13 ref.

Descriptors: "Turbulent flow, "Open channel flow, "Fluid mechanics, "Flow characteristics, "Anemometers, Data collections, Analytical techniques, Rivers, Channels, Flumes, Mathematical studies, Equations, Turbulence, Shear stress, Velocity, Slopes, Depth, Width, Flow rates, Temperature, Sediment transport, Suspended load, Bed load. Identifiers: "Hot-film anemometry.

Turbulence characteristics of turbulent shear flows obtained by employing hot-film anemometry are aummarized. Accompanying hydraulic and sediment data were collected and are included. Data were collected in 20 cm, 2-foot, 4-foot, and 8-foot wide recirculating flumes at Colorado State University over rigid and alluvial boundaries. Alluvial boundary data also were collected in the Atrisco Feeder Canal near Bernalillo, New Mexico, Rio Grande conveyance channel near Bernardo, New Mexico, Roisouri River near Omaha, Nebraska, and Mississippi River near Vicksburg, Mississippi. The data include longitudinal and vertical components of the turbulent intensity, macroscale and microscale of turbulence, Eulerian integral time scale, measured turbulent shear stress, local mean velocities, slope, depth, width, discharge, temperature, suspended sediment concentration, and total bed material discharge. Some longitudinal turbulence intensities were obtained from a standard Price current meter and a small propeller meter at three of the field locations. These data are reported along with the hot-film anemometer measurements. (See also W73-01304) (Woodard-USGS)

TRANSIENT FLOW, Geological Survey, Washington, D.C. M. S. Hellmann.

M. S. Heumann.
Available from NTIS, Springfield, Va 22151 as PB-209 839; Price \$3.00 paper copy; 95 cents microfiche. Geological Survey Computer Contribution No 12 (USGS-CCD-71-006), 1971. 39 p, 2

Descriptors: "Fluid mechanics, "Pipe flow, "Computer programs, "Systems analysis, "Computer models, Equations, Flow rates, Velocity, Inputoutput analysis, Analytical techniques, Viscosity, Programming languages. Identifiers: "Transient flow, Horizontal flow, Computer Stransient flow, Horizontal flow, Identifiers: Capillary tub

A computer program was designed to simulate the flow of incompressible fluids through a horizontal capillary tube when the fluid is subjected to a linear pressure gradient. The program analyzes the transient character of the flow of the fluid and provides tables of values for the simulated flows, accumulated flows, and velocities of the fluid as a function of the distance from the center of the tube, for a sequence of elapsed times. The equation used to characterize the flow of the fluid was derived from the Navier-Stokes countions by intion used to characterize the flow of the fluid was derived from the Navier-Stokes equations by introducing the change in the gradient with time. The program prepares printouts for the user including a table of time constants which are useful in analyzing the flow of fluids in another program; a set of tables containing accumulated flows, flows (average velocities), and instantaneous velocities for a sequence of times which can be stipulated by the user; and a timed velocity display which provides the user with an illustrative summary of the results. (Woodard-USGS)

AN ENGINEERING APPROACH TO TOTAL BED-MATERIAL LOAD BY REGRESSION ANALYSIS, Colorado State Univ., Fort Collins. Dept. of Civil Engineering. H. W. Shen, and C. S. Hung. Completion Report, (1969), 17 p, 15 fig, 1 tab, 23

Descriptors: *Sediment transport, *Sedimenta-tion, *Bed load, *Flow characteristics, *Regres-sion analysis, Methodology, Mathematical stu-dies, Equations, Forecasting, Streamflow, Flow rates, Particle size, Stochastic processes, Correla-tion analysis, Data collections, Channel morpholo-

An empirical relationship between the sediment bed material load concentration and the flow condition is determined by regression analysis from all available reliable data. The sediment concentration is a function of the flow velocity to the first power, the energy slope to the 0.57 power and the fall velocity of the median sediment size of the bed sample to the negative 0.23 power. Sixty-eight percent of all primary data fall within 0.6 to 1.6 of the recommended curve, and 95% of all the primary data fall within 0.37 to 2.72 of the recommended curve. All secondary data collected in flume studies agree with the recommended curve. The secondary river data show that the measured sediment concentrations are always much greater than the predictions by the recommended curve. This could be due to the difficulty in excluding wash load and to the validity of applying this curve to sediments with large gradation. As determined by regression analysis, the flow depth is unimportant in determining sediment concentration. However, the total sediment bed material load depends on flow depth as the flow discharge is the product of flow velocity, flow depth and width of the channel. (Woodard-USGS)

INVENTORY REPORT -- ALASKA REGION.
Corps of Engineers, Portland, Oreg. North Pacific

Available NTIS, Springfield, Va 22151 as AD-730 692; Price \$3.00 paper copy; \$0.95 cents microfiche. National Shoreline Study Report, Au-gust 1971. 24 p, 1 fig. 2 photo, 8 plate, 2 tab.

Descriptors: *Beach erosion, *Shore protection, *Census, *Coasts, *Alaska, Oceans, Gulfs, Bays, "Ceasus, "Coasts, "Alaska, Oceans, Guifs, Bays, Estuaries, Investigations, Reviews, Data collec-tions, Planning, Projects, Federal government, Shores, Coastal engineering, Coastal structures, Storms, Tides, Environmental effects, Land development, Recreation, Shoals, Shoreline cover, Berms, Navigation. Identifiers: "National shoreline seashore study, Inventory (Alaska).

In 1968, the 90th Congress authorized National appraisal of shore erosion and shore protection needs. The National Shoreline study is broken into three classes: Shore Erosion Inventories; Shore Protection Guidelines; and Shore Management Guidelines. A separate report has been prepared for each of these classes. This report presents an inventory of the physical characteristics, historical inventory of the physical characteristics, historical changes, and ownership and use of the coastal shorelines of Alaska, including major bays and estuaries. The historic changes studied relate to erosion produced by wave and tidal phenomenon. The purpose of the study is identification of those areas of serious erosion, considered in conjunction with economic, industrial, recreational, agricultural, navigational, and other relevant factor. The energy coastiline of Alaska is 6.60 miles agricultural, navigational, and other relevant factors. The general coastline of Alaska is 6,640 miles long, or 54% of the total 12,383 miles of general coastline of the United States. The tidal shoreline, which includes islands, inlets, and all shoreline to the head of tidewater, is estimated to be 47,300. (Woodard-USGS)

PRACTICAL GUIDANCE FOR ESTIMATING AND CONTROLLING EROSION AT CULVERT AND CONTROLLING EROSION AT CULVERY
OUTLETS,
Army Engineer Waterways Experiment Station,
Vicksburg, Miss.
For primary bibliographic entry see Field 04D.
W73-01324

DISTRIBUTION OF SHEAR STRESSES IN AN INCOMPRESSIBLE TURBULENT BOUNDARY LAYER, N. P. Romanenko, and V. G. Kalmykov.

Fluid Mechanics-Soviet Research, Vol 1, No 1, p 122-129, January-February 1972. 4 fig, 1 tab, 8 ref. (Originally published in Inzhenerno-Fizicheskiy Zhurnal, Vol 20, No 4, p 666-673, 1971).

Descriptors: "Fluid mechanics, "Shear stress, "Compressibility, "Turbulent boundary layers, Turbulence, Turbulent flow, Velocity, Pressure, Friction, Reynolds number, Cross-sections, Anemometers, Fluctuations, Distribution, Equations.

Identifiers: *USSR, Tangential stress, Velocity distribution, Pressure gradient, Diffusers.

distribution, Pressure gradient, Diffusers.

Results of a study of an isothermal turbulent boundary layer in air moving in axisymmetrical and plane diffusers are presented. Experiments were carried out for Reynolds numbers entering the diffusers from 48,500 to 202,000. Measurements of turbulence were made with a bot-wire anemometer and included average velocity distribution, intensity of turbulence of longitudinal and normal velocity components, distribution of eddy tangential stresses, and correlations between longitudinal and normal velocity fluctuations at a point. Correlation of experimental data on eddy tangential stresses provides reliable approximations of tangential stress distribution in boundary layers of flows with positive pressure gradients. The dependence of tangential stress distribution in the layer on the shape factor H is established and compared with experimental values obtained earlier. (Josefson-USGS)

EFFECT OF FREE-STREAM VARIABLES AND WALL TEMPERATURE ON FLOW BEHAVIOR IN THE PRE-SEPARATION ZONE OF A LAMINAR BOUNDARY LAYER,

LAMINAR BOUNDARY LATER, V. V. Vasyukov. Fluid Mechanics-Soviet Research, Vol 1, No 1, p 71-77, January-February 1972. 8 fig, 2 tab, 5 ref. (Originally published in Mekhanika Zhidkosti i Gaza, No 1, p 76-82, 1971).

Descriptors: *Flow, *Flow separation, *Boundary Jayers, "Boundaries (Surfaces), "Temperature, Heat flow, Cooling, Viscosity, Pressure, Density, Priction, Gases, Equations, Variability. Identifiers: "USSR, "Heat flux, Mach number, Prandtl number.

Results are presented of the effect of different fac-tors on flow behavior in the preseparation zone of a laminar boundary layer and on location of the a laminar boundary layer and on location of the separation point. Studies are made of the effect of wall temperature on flow in the preseparation zone and on location of the separation point for different free-stream Mach aumbers, particularly in cases of strong cooling. Also examined is the effect of the Prandtl number and temperature dependence of viscosity on the location of the separation point of a laminar boundary layer for different wall temperatures and Mach numbers. Data are given on the effect of wall temperature, Mach number, temperature dependence of viscosity, and Prandtl number on the distribution of thest fluxes and friction at the preseparation point of a laminar boundary layer. The manner in which the location of the separation zone and the distribution sammar boundary layer. The manner in which the location of the separation zone and the distribution of heat fluxes and friction affect the different means of specifying pressure distribution along a body surface is described. (Josefson-USGS) W73-01334

SYNTHESIS OF HYDROGRAPHS AND WATER SURFACE PROFILES FOR UNSTEADY OPEN CHANNEL FLOW WITH LATERAL INFLOWS, Cornell Univ., Ithaca, N.Y. Dept. of Hydraulic

Available from University Microfilms, Ann Ar-bor, Michigan, Order No. 65-5841 Xerox \$7.00, microfilm \$2.75. Ph. D. Dissertation, 1965. 150 p.

Field 08-ENGINEERING WORKS

Group 8B-Hydraulics

Descriptors: *Hydrographs, *Mathematical modeling, *Roughness (Hydraulic), *Open channel flow, Flow, Discharge.

A seventy-two foot experimental flume with variable lateral inflows was run under steady and unsteady conditions to compare measurements to predictions. The numerical solution used the continuity and momentum equations and was accomplished with a CDC 1604 computer. Channel cross-sections, baseflow in the channel, time-spatial distribution of the lateral inflows, and a Manning 'n' to describe the rousehous were required as invited described. tribution of the lateral inflows, and a Manning 'n to describe the roughness were required as input information. Depth and discharge measurements for four unsteady russ agreed well with that predicted. Agreement between the experimental discharge and that computed by the unit-hydrograph and Muskingum methods was not as good because of the limitations of the methods. The nubecause of the limitations of the methods. The nu-merical solution to the differential equations was quite sensitive to channel roughness. This problem can be minimized, being about as difficult as problems associated with more familiar routing techniques. (Anderson-Texas) W73-01358

PRACTICAL GUIDANCE FOR ESTIMATING AND CONTROLLING EROSION AT CULVERT OUTLETS, Army Engineer Waterways Experiment Station, Vicksburg, Miss.

B. P. Fletcher, and J. L. Grace, Jr.

U.S. Army Engineer Waterways Experiment Station, Miscellaneous Paper H-72-5, May 1972. 11 p.

Descriptors: *Culverts, *Energy dissipation, *Erosion, *Outlets, *Riprap, *Scour, *Storm drains, *Erosion control.

Paper summarizes results of research conducted at the Waterways Experiment Station during the past nine years to develop practical guidance for esti-mating and controlling erosion downstream oc-uvert and storm-drain outlets. Initial efforts were mating and controlling erosion downstream of culvert and storm-drain outlets. Initial efforts were concerned with investigation and development of means of estimating the extent of scour to be anticipated downstream of outlets. Subsequent efforts have involved investigation and evaluation of various achemes of protection for controlling erosion such as horizontal blankets of rock riprap, preformed scour holes lined with rock riprap and channel expansions lined with natural and artificial revetments. In addition, efforts have been made to determine limiting discharges for various energy dissipators including simple flared outlet transitions, stilling walls, Bureau of Reclamation type VI basins and St. Anthony Falls stilling basins. Empirical equations and charts are presented for estimating extent of localized scour to be anticipated downstream of culvert and storm-drain outlets, size and extent of various natural and artificial type revetments and maximum recommended discharge for each type of energy dissipator investigated. With these results, designers can estimate extent of scour to be expected and select appropriate and alternative schemes of protection for controlling erosion downstream of culverts and storm-drain outlets. (Fletcher-WES)

NAVIGATION CONDITIONS IN THE LITTLE

NAVIGATION CONDITIONS IN THE LITTLE ROCK REACH, ARKANSAS RIVER; HYDRAU-LIC MODEL INVESTIGATION, Army Engineer Waterways Experiment Station, Vicksburg, Miss.

J. I. Franco, and L. J. Shows.
Sponasored by U.S. Army Engineer District, Little Rock. U.S. Army Engineer Waterways Experiment Station, Technical Report H-72-3, April 1972. 36 p, 6 tab, 57 pl.

Descriptors: Bridges, *Hydraulic models, *Navigation, *Channel improvement. Identifiers: *Arkansas River, *Little Rock Reach, *Navigation conditions.

The Little Rock Reach is a comparatively straight and relatively narrow reach of the Arkanasa River located between Little Rock and North Little Rock, Ark, Six bridges are located in this reach of the river within a distance of about 1.4 miles in the vicinity of mile 165. The model investigation was primarily concerned with navigation conditions in the reach particularly as affected by the bridges and with the development of plans as required to provide satisfactory navigation for both upbound and downbound traffic. An undistorted, fixed-bed, 1:100-acale model reproduced about 3 miles of the Arkanasa River and adjacent overbank areas and the six bridges located in the reach. The results of the investigation indicated that with existing conditions navigation conditions would tend to be hazardous because of the limited clearances available at all of the bridges, relative alignment of the bridge spans, limited maneuver distance between bridges, and alignment and velocity of currents. Improvement of the reach would require modification of at least five of the existing bridges and the use of training structures to improve the alignment of currents and to reduce the tendency of shoaling downstream of the bridges. (Franco-WES) W73-01385

EAST GREENACRES UNIT, PRAIRIE DIVI-SION, RATHDRUM PRAIRIE PROJECT, IDAHO (FINAL ENVIRONMENTAL IMPACT STATEMENT),
Bureau of Reclamation, Boise, Idaho, Region 1.

Available from the National Technical Informa-tion Service as EIS-ID-72-4541-F, \$4.50 in paper copy, \$0.95 in microfiche. May 19, 1972. 44 p, 1

Descriptors: "Idaho, "Environmental effects, "Irrigation systems, "Piping systems (Mechanical), Groundwater, Irrigation wells, Water wells, Irrigation water, Distribution systems, Pipes, Water distribution (Applied), Irrigation programs, Reservoirs, Irrigated land, Recreation facilities, Pumps, Lateral conveyance structures, Water pressure, Pressure, Pressure conduits, Pipe flow, Groundwater resources, Water sumply. water resources, Water supply.
Identifiers: *Environmental Impact Statements,
*Rathdrum Prairie Project (Idaho).

This project involves: construction of wells and pumps to provide a water supply for irrigation, domestic and livestock uses; construction of about 40 miles of buried pressure pipe distribution system; construction of a buried reservoir to regusystem; construction of a buried reservoir to regu-late water pressure for the distribution system; and expansion and rehabilitation of an existing recreational access site at Twin Lakes. The unit will be located on the Rathdrum Prairie in Kootenai County, in northern Idabo. Full irriga-tion service will be provided by the project to 5,340 acres, 1810 of which are currently irrigated and 3,540 are dryfarmed, thereby stabilizing the area's faure economy. The system will also provide and 3,540 are dryfarmed, thereby stabilizing the area's farm economy. The system will also provide water for domestic and livestock uses. The unit's substitution of ground water as a source of irrigation water supply will make it possible to regulate Twin Lakes to enhance recreation and improve the quality of the lake fishery. Adverse environmental effects will include: loss of present use to about 16 acres of lands required for rights-of-way and facilities, and short-term alteration of the existing environment. Alternatives considered include no project, rehabilitation of the existing distribution system and suppolemental ground-water pumping. system and supplemental ground-water pumping. Comments from interested agencies are included. (Ellis-Florida) W73-01396

TECHNIQUE FOR ASSESSMENT OF PARTI-CLE BREAKAGE IN NATURAL AND ARTIFI-

CIAL ENVIRONMENTS, Commonwealth Scientific and Industrial Research Organization, Canberra. (Australia). Div. of Soils. For primary bibliographic entry see Field 02J. W73-01462.

DISCONTINUITIES UNIVERSAL UNIVERSAL DISCONTINUITIES
BEDFORMS PRODUCED BY THE WIND,
Reading Univ. (England). Sedimento
Research Lab.
For primary bibliographic entry see Field 02J.
W73-01465

MOTIONS OF MOLECULES IN LIQUIDS: VISCOSITY AND DIFFUSIVITY, California Univ., Berkeley. Dept. of Chemistry. For primary bibliographic entry see Field 01B. W73-01475

TRANSPORT VELOCITIES OF INDIVIDUAL SIZE FRACTIONS IN HETEROGENEOUS BED Louisiana dies Inst. a State Univ., Baton Rouge. Coastal Stu-For primary bibliographic entry see Field 02J. W73-01478

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FIBERGLASS-COATED WOODEN WEIRS FOR RUNOFF MEASUREMENTS,
Agricultural Research Service, Tucson, Ariz.
Southwest Watershed Research Center. Journal of Soil and Water Conservation, Vol 27, No 5, p 229-231, September-October 1972. 2 fig, 10

Descriptors: "Weirs, Water management, "Flow measurement, Equipment, Gaging stations, Stream gages, Discharge (Water).

Stream gages, Discharge (Water).

Temporary weirs may be built from wooden timbers attached to existing concrete grade-control structures with masonry anchor bolts. A fiberglass-coated crest section is bolted to the base section. Several factors enhanced the use of wood for these weirs. First, there is a large savings in total costs. A comparable reinforced concrete structure costs from 3 to 10 times as much as a wooden one, depending on location. Second, wood building materials are easy to transport. Third, precise dimensional control of the crest is assured. Such a crest is easy to repair or, if badly damaged, to replace. Fiberglass-coated wooden weirs may be constructed at an average cost of \$400 each, including labor. Wooden weirs are recommended where short-term or temporary runoff measurements are needed and where hand construction is necessary or desirable. If no coarse, abrasive sediment load exists in a channel, the life expectancy of the structure should exceed the life expectancy of the structure should excee 10 years. (Knapp-USGS) W73-01501

HYDROGRAPH ROUTING IN OPEN CHAN-

MINROGARTH MELS, Minnesota Univ., Minneapolis. C. E. Rice. Ph D Thesis, June 1972. 204 p, 47 fig, 22 tab, 36 ref, 3 append. OWRR A-023-MINN (2).

Descriptors: "Routing, "Hydrograph analysis, "Flood routing, "Simulation analysis, "Computer programs, Unsteady flow, Flood forecasting, Numerical analysis, Finite element analysis, Water storage, Roughness (Hydraulic), Minnesota.

A simulation model of an open channel system was used to evaluate some existing flood routing methods, observe the effect of different physical variables on flood wave movement, and to develop a simple routing method. The dynamic equations of unsteady flow were used to route flood hydrographs through the channel system and outflow hydrographs were generated. The method of characteristics with a specified time interval was used to solve the unsteady flow equations. The Direct and Explicit methods used to solve the unsteady flow equations gave excellent results compared with the Simulation Model results. The peak discharge varied linearly with distance down

the channel but the peak depth varied as a power function with distance down the channel. The times of occurrence of the peak discharge and depth varied exponentially with distance down the channel. The times of occurrence of the peak discharge and the peak depth were significantly more dependent on the channel roughness than on the channel alope. The peak depth lagged the peak discharge with the lag time increasing as the flood wave moves down the channel. (Knapp-USGS) W73-01503

STUDIES TO DEVELOP AND INVESTIGATE AN INVERSE FORMULATION FOR NUMERICALLY SOLVING THREE-DIMENSIONAL FREE SUFFACE FOTEMTIAL FLUID FLOWS, Utab Water Research Lab., Logan.

Utah Water Research Laboratory, Report PRWG-96-1, March 1972. 37 p, 9 fig, 2 tab, 20 ref. NSRDC N00014-67-A-0220-0003.

Descriptors: "Open channel flow, "Mathematical studies, "Finite element analysis, "Flow around objects, Flow nets, Computer programs, Numerical analysis, Dimensional analysis.

Identifiers: Free-surface flows.

Identifiers: Free-surface flows.

An inverse formulation is given for solving three-dimensional potential fluid flows. The magnitudes of the cartesian coordinates x, y, and z are the dependent variables in the space defined by the potential fluction and two mutually orthogonal stream surface functions whose intersection defines the physical space streamlines. This formulation reverses the usual role of the variables. In this inverse space, irregular boundaries with naknown position in the physical space (such as free surfaces) become plane boundaries, and the space of most potential flow problems is a parallelepiped. The 3 basic partial differential equations resulting from this formulation are nonlinear. Finite difference methods are given for solving the space boundary value problems simultaneously. The applicability of the inverse formulation and the numerical solution is demonstrated by obtaining a solution to the three-dimensional, free surface flow past a vertical strut which extends through the fluid surface and is placed between channel walls. (Knapp-USGS)

CALIBRATION OF PARSHALL FLUMES WITH NON-STANDARD ENTRANCE TRANSITIONS,

NUN-STANDARD ENVIANCE TRANSITIONS, Utah Water Research Lab., Logan. C-L. Chen, C. G. Clyde, M-S. Chu, and C-Y. Wei. Utah Water Research Laboratory Report PRWG102-1, March 1972. 35 p, 19 fig, 19 tab, 6 ref, append.

Descriptors: *Calibrations, *Venturi flumes, *Discharge measurement, *Stage-discharge relations, Hydraulics thydraulic structures, Stream gages, Gages, Venturi meters, Water measurement.

*Leantifiera: *Parshall flumes.

Parshall flumes were tested with non-standard transitions and with the throat section level with the bottom of an incoming pipe. The measured discharges for given flow depths (free flow) or differences in flow depths (submerged flow) deviate quite significantly from the computed standard Parshall flume discharges at both low- and high-flow rates. New empirical formulas take such deviations into account. The values of the coefficients and exponents contained in the new formulas depend on the throat size of the flume and the slope of the incoming pipe. Calibration curves and tables were prepared for convenient application of the new formulas. The larger the flume throat size and the steeper the slope of the incoming pipe, the greater is the difference between the actual flume flow and the flow predicted by the standard formulas. (Knapp-USGS)

CALCULATION OF THE KINEMATIC CHARACTERISTICS OF A TURBULENT FLOW WITH NONSTATIONARY MOTION, E. V. Francisco

E. V. Eremenko. Fluid Mechanics-Soviet Research, Vol 1, No 2, p 169-179, March-April 1972. 2 fig. 14 ref.

Descriptors: "Fluid mechanics, "Flow characteristics, "Turbulent flow, "Non-uniform flow, "Unsteady flow, Viscosity, Reynolds number, Boundary layers, Velocity, Energy, Energy budget, Energy loss, Energy dissipation, Channels, Profiles, Equations, Continuity equation, Energy equation, Momentum equation. Identifiers: "USSR, "Kinematics.

A method is presented for computing the kinematic characteristics and energy losses of turbulent nonstationary flows. A closed system of differential equations is obtained using Reynolds equations, the continuity equation, and the turbulent energy equation. The equations are solved numerically for nonstationary motion in a smooth channel. Calculations yield profiles of average turbulent velocity and energy, and comparison with experimental data indicates qualitative agreement. (Josefson-USGS)

CALCULATION OF THE STATISTICAL CHARACTERISTICS OF THE SURFACE PRESSURE FLUCTUATIONS FROM THE SECOND MOMENTS OF THE LONGITUDINAL VELOCITY FLUCTUATIONS IN THE BOUNDARY LAYER,
T. N. Krasil'nikov.

Fluid Mechanics-Soviet Research, Vol 1, No 2, p 163-168, March-April 1972. 10 ref.

Descriptors: *Boundary layers, *Surfaces, *Pressure, *Velocity, *Fluctuations, Flow, Compressibility, Poisson ratio, Equations, Continuity equation.

Identifiers: *USSR, Navier-Stokes equations.

A simple relationship exists between pressure fluctuations at a surface and velocity fluctuations in a boundary layer. An equation for surface pressure fluctuations in a turbulent boundary layer is derived from a Poisson equation for the distribution of pressure over the surface of a plate. The equation is valid when the main flow is parallel to the plate and when the flow arrives at the plate at an angle. By using this equation, pressure characteristics can be refined provided precise measurements of second-order moments of the velocity fluctuation component are made in the immediate vicinity of the surface. A similar approach can be used to define the pressure fluctuation on a curvilinear surface in an incompressible fluid and to study the pressure fluctuations in turbulent boundary layers in incompressible fluids. (Josefson-USGS)

UNDERWATER POLLUTION CONTROL, Esso Production Research Co., Houston, Tex. (assignee). For primary bibliographic entry see Field 05G. W73-01538

SUBMERGED OIL LEAK CONTROL, For primary bibliographic entry see Field 05G. W73-01546

ANALYSIS OF BUOYANT JETS WITHIN THE ZONE OF FLOW ESTABLISHMENT, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 05B. W73-01566 DEPOSITION OF FINE SEDIMENTS IN TURBU-LENT FLOWS, Florida Univ., Cainesville. Dept. of Coastal and Oceanographic Engineering. For primary bibliographic entry see Field 62J. W73-01562.

FLOW INTO A STRATIFIED RESERVOIR. California Univ., Berkeley. For primary bibliographic entry see Field 05B. W73-01570

HARBOR DREDGING PRESENTS ANOTHER WASTE DISPOSAL PROBLEM. For primary bibliographic entry see Field 05E. W73-01643

MIXING OF A HEATED SURFACE JET IN TURBULENT CHANNEL FLOW, California Univ., Berkeley. Dept. of Civil Engineering; and California Univ., Berkeley. Hydraulic Engineering Lab. For primary bibliographic entry see Field 05B. W73-01703

HYDRAULIC MODEL STUDIES OF THE CANAL STRUCTURES ADJACENT TO BACON SIPHON AND TUNNEL, COLUMBIA BASIN PROJECT, WASHINGTON, Bureau of Reclamation, Denver, Colo. For primary bibliographic entry see Field 68A. W73-01779

SOLUTION OF FLOW UNDER SLUICE GATES, Oceanics, Inc., Plainview, N.Y.
Y. K. Chung.
Journal of the Engineering Mechanics Division, American Society of Civil Engineers, Vol 98, No EM1, p 121-140, Feb 1972. 7 fig. 15 ref, 2 append.

Descriptors: "Sluice gates, "Flow characteristics, "Mathematical models, Bibliographies, Hydraulic gates, Gates, Free surfaces, Discharge coefficient, Hydraulic structures, Fluid mechanics, Hydraulics, Discharge (Water), Flow rates. Identifiers: "Contraction coefficients, Conformal mapping, Contraction perturbation."

Studies were made to obtain a rate of discharge for different combinations of gate openings and upstream free-surface elevations. An analytical perturbation solution uses a realistic mathematical model to show the gate opening as small and the upstream free surface as horizontal. Solutions for discharge and contraction coefficients are obtained in terms of a small parameter. Conformal mapping and analytic continuation and perturbation methods were combined to obtain a solution up to the second order. Discharge and contraction coefficients obtained from other solutions are compared with those of this study. Flow under a sluice gate of variable angle is considered with similar procedures, but solutions for the same coefficients were obtained only up to the first order. Boundary equations and conditions were obtained from the omega function. From solutions for the omega function, second order perturbation solutions are obtained for a vertical sluice gate. (USBR)

TWO-DIMENSIONAL SINK FLOW OF A STRATIFIED FLUID CONTAINED IN A DUCT, California Univ., Berkeley.

J. Imberger.
Journal of Fluid Mechanics, Vol 53, Part 2, p 329-349, May 1972. 11 fig., 1 tab, 10 ref, append.

Descriptors: *Fluid mechanics, *Stratified flow, *Sinks, *Theoretical analysis, Model studies, Buoyancy, Withdrawal, Ducts, Velocity distribu-

Field 08-ENGINEERING WORKS

Group 8B-Hydraulics

tion, Saline water, Laboratory tests, Laminar flow, Density, Viscosity. Identifiers: Schmidt number, Test results, Velocity profiles, Velocity head.

Theoretical and experimental studies determined the withdrawal-layer thickness as a function of distance from the sink. A reservoir is assumed to be filled with water having a linear variation of density with depth. Boundaries are simplified to a parallel walled duct with the line sink at the center of the fluid. For fluids with a Schmidt number of unity, the withdrawal layer is composed of distinct regions with balanced forces. Outer flow changes from parallel uniform flow to a symmetrical withdrawal layer near the sink. Inertial forces close to the sink become equally important as buoyancy and viscous forces. Equations valid in this region are derived. Combining inner and outer variations of withdrawal layer thickness yields a composite solution, showing that inclusion of intratial forces gives layer thicknesses greater than those having a buoyancy-viscous force balance. this those having a buoyancy-viscous force balance. Laboratory tests show withdrawal-layer thicknesses close to values predicted by integral solution. (USBR) W73-01791

8C. Hydraulic Machinery

FIELD PERFORMANCE AND EVALUATION OF TWO AUTOMATIC SUSPENDED SEDI-MENT FUMPING SAMPLERS, Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 02J.
W73-01318

LIQUID WASTE FEED SYSTEM. National Aeronautics and Space Administration, Washington, D.C. (assignee). For primary bibliographic entry see Field 05D. W73-01536

THE BUCKS CREEK PROJECT NO. 619 -CALIFORNIA. (DRAFT ENVIRONMENTAL IM-PACT STATEMENT).
Pacific Gas and Electric Co., San Francisco, Calif.

Available from the National Technical Informa-tion Service as PB-200 779D, \$3.00 in paper copy, \$0.95 in microfiche. July 13, 1971. 51 p, 3 fig.

Descriptors: Hydroelectric project licensing, *Environmental effects, Electric power industry, Water pollution, Powerplants, Game birds, Birds, Recreation, Archaeology, *California, Appraisals. Identifiers: *Environmental impact statements, *Bucks Creek Project, Pacific Gas and Electric Company, Army Corps of Engineers, Game

The proposed action is an administrative matter upon the Application for New Major License by Pacific Gas and Electric Company for the Bucks Creek Project. The project is located on Bucks, Grizzly, and Milk Ranch Creeks and their tributaries - all tributaries of the North Fork Feather ries - all tributaries of the North Fork Feather River - and on North Fork Feather River, in Plumas County, and Plumas National Forest, California. The Bucks Creek project consists of several dams, tunnels and enroutes having an average annual energy output of about 241.3 million kilowatt hours. The environmental impact of the proposed hydroelectric facilities is presented. The project watershed is populated by a variety of game animals, serves as a nesting ground and salmon spawning area, and has great recreational value. Measures to avoid or mitigate damage are outlined generally and alternatives to the proposed action are presented. (Oleszkiewicz-Vanderbilt) W75-01705 MYSTIC LAKE RELICENSING, PROJECT NO. 2301 - MONTANA. (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Montana Power Co., Butte.

Available from the National Technical Informa-tion Service as PB-199 323-D, \$3.00 in paper copy, \$0.95 in microfiche. May 21, 1971, 44 p, 3 photos.

Descriptors: *Hydroelectric project licensing, *Environmental effects, *Montana, Electric power industry, Water pollution, Powerplants, Recreation, Appraisals, Reservoirs. Identifiers: *Mystic Lake Project, *Environmental Impact Statements, Montana Power Company.

tal Impact Statements, Montana Power Company.

The project consists of a headwater storage reservoir known as Mystic Lake, with a usable capacity of 21,000 acre feet, connected to the powerhouse by 2-1/2 miles of closed conduit. This reservoir is formed by a dike across the natural outlet of Mystic Lake and a dam at the new outlet. Water from the reservoir is conducted through the tunnel, pipeline, surge tank and penstock to the powerhouse located on West Rosebud Creek about 2 miles downstream from Mystic Lake. The generating plant operates with rated capacity of 10,000 kilowatts and a capability of 11,500 kilowatts under an effective head of 1,050 feet. The existing project development would be modified by construction of a reregulating dam and reservoir. The issuance of a new fifty-year license for Mystic Lake will not have any significant impact on the environment. All pros and cons are presented accompanied by copies of all pertinent documents. (Oleszkiewicz-Vanderbilt) W73-01706

PUMPING-GENERATING UNITS FOR THE GRAND COULEE PUMPING-GENERATING

GRAND COULEE PUMPING-GENERATING PLANT, Bureau of Reclamation, Denver, Colo.; and Bu-reau of Reclamation, Boise, Idaho. Region 1. C. B. Brown, and E. M. Tomsic. Paper presented at Institute of Electrical and Elec-tronics Engineers, Summer Power Meeting, San Francisco, Calif., July 1972. 7 p, 7 fig, 3 ref.

Descriptors: "Pumped storage, "Pump turbines, "Electric power production, "Peaking capacity, Peak power, Irrigation water, Supervisory control (Power), Power transformers, Switchgear, Electrical equipment, Peak loads. Identifiers: "Generator-motors, Power cables, Grand Coulee Pumping Plant (Washington).

The Grand Coulee Pumping-Generating Plant is the primary source of water for the vast Columbia Basin Irrigation Project. Two new units will be installed in the hydrocomplex to serve dual purposes of irrigation pumping and pumped storage generation. The pumping-generating units are designed to use the top 2 ft of storage in Banks Lake for peaking bower during the day, pumping the water back into the lake during offpeak night hours. Initially the peaking capacity of the 2 units will be 100,000 kw during 9 hrs for 5 days per week with an ultimate capacity, when future units are installed, of 247,000 kw under normal conditions. Pump-turine characteristics, starting methods, electrical connections, power transformers, switchgear, generator/motors, and the control and data acquisition system are discussed. (USBR)

SECOND POWERHOUSE, BONNEVILLE LOCK AND DAM, COLUMBIA RIVER, OREGON AND WASHINGTON (FINAL ENVIRONMENTAL IM-PACT STATEMENT). Army Engineer District, Portland, Oreg.

Available from the National Technical Informa-tion Service as PB-202 133-F, \$3.00 in paper copy, \$0.95 in microfiche. November 15, 1971. 194 p, 1

Descriptors: "Washington, "Environmental effects, "Hydroelectric powerplants, "Electric power production, "Columbia River, Engineering structures, Turbidity, Water resources development, Hydroelectric power, Electric power, Power operation and maintenance, Hydroelectric plants, Rivers, Dams, Electricity, Water allocation (Policy), Water utilization. Identifiers: "Environmental Impact Statements, "Boanneville Dam (Ore and Wash).

*Bonneville Dam (Ore and Wash).

This project consists of construction, general operation, and maintenance of an eight-unit second powerhouse on the Columbia River at the existing Bonneville Dam in Skamania County, Washington. Environmental impacts include: highway and railroad relocations, removal of the town of North Bonneville and relocation of its citizens, excavation and disposal of about 18 million cubic yards of material, loss of some wetlands, increased downstream mortality of fish, elimination of a sport fishing site, reduction of nitrogen supersaturation downstream, increased capacity and electrical energy production. Other adverse environmental effects include: filling of a low elevation area downstream of the project, temporary turbidity during construction, and anie and air pollution associated with construction activities. Alternatives to the proposed action are: no action, different powerhouse size, different powerhouse location, and addition of new navigation lock. Many ecosystems in the immediate area of the project will be altered, however, the new generating units will provide power for long term use and industrial production in the region. Irreversible commitments include 130 acres of 130 acres of 30 and rock and will have a permanent effect on the area. Comments from interested agencies and groups are included. (Crow-Florida) W73-01907

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CARPENTER AND REMMEL DEVELOPMENTS (DRAFT ENVIRONMENTAL IMPACT STATE-MENT). Arkansas Power and Light Co., Little Rock.

Available from the National Technical Informa-tion Service as PB-208 882-D, \$3.00 in paper copy, \$0.95 in microfiche. May 4, 1972. 67 p, 2 map, 3

Descriptors: *Arkansas, *Environmental effects, *Power system operation, *Multiple-purpose projects, Hydroelectric plants, Permits, Power operation and maintenance, Powerplants, Facilities, Pagencies, Regulation, Administrative agencies, Reservoirs, Water pollution, Water pollution sources, Regulation, Flooding.

Identifiers: *Environmental Impact Statements, *Carpenter and Remmel Developments.

*Carpenter and Remmel Developments.

This action involves the review of an application for a new licease filed by Arkansas Power and Light Company for its existing power generating facilities, the Carpenter and Remmel Development Projects, located in Hot Springs and Garland Counties, Arkansas. The Carpenter Development consists of a dam, reservoir, a powerhouse with two generating units, and appurtenant facilities; Remmel Development is similar with three generating units. The combined output of the two facilities is 65,300 KW. The projects provide a source of water recreation and water supply for the surrounding area as well as a source of electric power. The environmental effect of the continued operation of the projects will be the same as has existed since 1924. No foreseeable adverse effects will result except for the continued inundation of 9,140 acres of river basin and woodlands. There have been some pollution problems in recent years; however, the applicant has cooperated in helping to reduce pollution. Alternatives considered include licensing another applicant,

government take-over, and abandonment of the projects. All alternatives were considered un-desirable. (Ellis-Florida) W73-01910

NEWHALEM CREEK PROJECT, WASHING-TON (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Scattle Dept. of Lighting, Wash.

Available from the National Technical Informa-tion Service as PB-199 639-D, \$3.00 in paper copy, \$0.95 in microfiche. May 21, 1971. 31 p, 1 map, 6 photo, 3 append.

Descriptors: "Washington, "Environmental effects, "Hydroelectric project licensing, "Hydroelectric plants, "Diversions, Dams, Hydroelectric power, Electric power production, Electric power production, Electric powerplants, Discharge (Water), Generators, Diversion structures, Engineering structures, Aquatic habitats, Trout, Streamflow, Alteration of flow, Surface waters, Permits, Fish conservation. Identifiers: "Environmental Impact Statements, Newhalem Creek (Wash).

The proposed action is an application for a license to continue the operation of a hydroelectric plant located on Newhalem Creek, a tributary of the Skagit River in Whatcom County, Washington. The project's 10-foot diversion dam diverts 20 c.f.s. to 65 c.f.s. through a 3,500-foot tunnel to a powerhouse containing a 2,500 kw generating unit. The major environmental impact of the plant would be to alter the flows of the Newhalem Creek from the diversion dam. The extent of damage to trout in the creek is unknown. The operation of the plant does not significantly affect any other wildlife resources. The proposed construction of a footpath and a footbridge across the Skagit River will have no adverse environmental effects. The alternative of discontinuing the operation of the plant and purchasing power from another source is not considered feasible. (Beardsley-Florida) W73-01920 W73-01950

8D. Soil Mechanics

LABORATORY STUDIES OF THE ERODIBILI-TY OF COHESIVE MATERIALS, Agricultural Research Service, Oxford, Miss. Sedimentation Lab. For primary bibliographic entry see Field 02J. W73-01319

SOLUBILITY CHARACTERISTICS OF ROCKS, SOLUBILITY CHARACTERISTICS OF ROCKS, SOILS, AND MUD (GORNYYE, POCHVEN-NYYE I ILOVYYE RASTVORY), Akademiya Nauk SSSR, Novosibirsk. Institut Neorganicheskoi Khimii. For primary bibliographic entry see Field 02G. W73-01325

MIDLAND LOCAL PROTECTION PROJECT, LICKING RIVER, KENTUCKY (DRAFT EN-VIRONMENTAL IMPACT STATEMENT). Army Engineer District, Louisville, Ky.

Available from the National Technical Informa-tion Service as EIS-KY-72-4584-D, \$3.00 in paper copy, \$0.95 in microfiche. May 1972. 5 p.

Descriptors: "Kentucky, "Environmental effects, "Flood protection, "Levees, "Channel improvement, Flood control, River regulation, Rivers, Channels, Stream improvement, Economic impact, Industries, Community development, Regional development, Flood plains, Wildlife habitats, Silting, Water management (Applied), Fisheries. runeries.

Identifiers: *Environmental Impact Statements,
*Licking River (Ky).

This flood protection project involves construction of a system of levees and channel improvements along an 11-mile reach of the Licking River between the cities of Lexington and Ashland, Kentucky. The proposed improvements will provide 21,000 acres of flood-free lands for industrial and residential development with planned open spaces and various recreational facilities. The resultant growth will upgrade an economically depressed area. The development will modify the present ecosystem, removing game habitat and forcing wildlife to new areas. The existing land-scape will be modified to meet the desires of developers, and existing flora and fauna will be destroyed or forced out of the area. Other adverse effects include a loss of about 7,500 feet of river due to channel realignment with resultant loss of stream fishery and streambank habitat, gradual urbanization of about 21,000 acres of mixed agriculture and woodlands, and increased silt land in the stream during construction. Alternatives considered were no action, channel improvement, and alternate levee plans. (Ellis-Florida)

LONG DRAW RESERVOIR ENLARGEMENT PROJECT, COLORADO—AN APPLICATION UNDER THE SMALL RECLAMATION PROJECTS ACT FOR WATER SUPPLY AND STORAGE COMPANY (DRAFT ENVIRONMENTAL IMPACT STATEMENT).

Burgan of Reclamation Denser Colo Region 7. Bureau of Reclamation, Denver, Colo. Region 7.

Available from the National Technical Informa-tion Service as EIS-CO-72-4699-D, \$4.75 in paper copy, \$0.95 in microfiche. June 7, 1972. 41 p, 4 fig, 2 map, 6 append, 1 tab.

Descriptors: *Irrigation, *Colorado, *Environ-mental effects, *Dams, Water yield improvement, Reservoirs, Reservoir yield, Dependable supply, Multiple-purpose projects, Snow melt, Water loss, Water supply, Irrigation water, Recreation, Fish-ing, Seepage control, Fisheries, Wildlife habitats, Borrow pits, Earth dams. Identifiers: *Environmental Impact Statements, *Long Draw Reservoir (Colo).

The project entails the enlargement of an existing earthfill dam on La Poudre Pass Creek, Colorado, The project entails the enlargement of an existing earthfill dam on La Poudre Pass Creek, Colorado, to increase the present reservoir storage capability. The project also involves lining sections of and generally improving the Grand River Ditch in Roosevelt National Forest in Colorado. Reduction of water seepage will be accomplished by the lining. In conjunction with the enlargement of the dam and reservoir new recreational facilities have been proposed. The proposed project will provide a consistent and reliable supplemental water supply to 37,425 acres of irrigated land. Enlargement of the Long Draw Dam will strengthen the existing structure to create a safer dam. The enlarged reservoir will inundate and eliminate approximately 106 acres of present wildlife habitat. The project will not have a significant adverse long-term environmental impact. It will prevent the seasonal emptying of the reservoir for irrigation and thus enhance fish, wildlife and recreation of the seasonal emptying of the reservoir for irrigation and thus enhance fish, wildlife and recreation ditches and modifying other existing water systems. Each was rejected either because of prohibitive cost or lack of significant additional water supply. (Nielsen-Florida)

HIPES LAKE PROJECT, CRAIG CREEK, VIR-GINIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Norfolk, Va.

Available from the National Technical Informa-tion Service as EIS-VA-72-4574-D, \$3.00 in paper copy, \$0.95 in microfiche. May 1972. 8 p.

Descriptors: *Virginia, *Environmental effects, *Dam construction, *Reservoir construction,

*Reservoir fisheries, Fish hatcheries, Multiple-purpose reservoirs, Earth dams, Outlet works, Flood control, Water quality control, Recreation, Recreation facilities, Wildlife conservation, Fish conservation, Trout, Cold-water fish, Fish management, Flood protection, Water storage, Engineering structures. Identifiers: *Environmental Impact Statements, *Craig Creek (Va). Identifiers: *Envi *Craig Creek (Va).

*Craig Creek (Va).

The proposed action calls for the construction of a 172 foot high earth and rockfill dam for a mile purpose reservoir on Craig Creek, about 15 miles above its confluence with the James River in Botetourt and Craig Counties, Virginia. The project will also consist of a trout rearing station and multi-level outlet storage release to establish a cold water fishery habitat in the stream below the dam. The project would provide flood control, water quality control, recreation, fish and wildlife conservation and economic development. The project will establish 23 miles of warm water stream fishing habitat. About 5,000 acres of forest wildlife habitat, 150 homesteads, and numerous summer cabins will be destroyed. The small town of Oriskany with 25 houses will be dislocated, and a free flowing stream scenic area would be replaced with a body of water in an essentially lakeless region. Alternatives considered included nonstructural flood plain management measures, levees and floodwalls, stream diversions, and various reservoir sites. (Beardsley-Florida) W73-01403 voir sites. () W73_01403

CIBOLO PROJECT, TEXAS (DRAFT ENVIRON-MENTAL IMPACT STATEMENT). Bureau of Reclamation, Amarillo, Tex. Region 5.

Available from the National Technical Information Service as PB-207 729-D, \$3.00 in paper copy, \$0.95 in microfiche. March 27, 1972. 39 p, 2 map.

Descriptors: *Texas, *Earth dams, *Reservoirs, Descriptors: "Iexas, "Eartin dams, "Reservoirs, Environmental effects, "Spillways, Dams, Dam design, Damsites, Earthworks, Flood control, Floodgate, Water supply, Water storage, Flood-ing, Flood protection, Flood plains, Wildlife habitats, Multiple-purpose projects, Relocation, Groundwater resources, Aquatic habitats, Water-

fowl.
Identifiers: *Environmental Impact Statements, *Cibolo Creek Project (Tex).

The proposed project in Wilson County, Texas, involves the construction of a rolled earth-filled dam 3.8 miles long and 110 feet high with concrete spillway on Cibolo Creek 22.5 river miles upstream 3.8 mies long and 110 feet high with concrete spill-way on Cibolo Creek 22.5 river miles upstream from its confluence with the San Antonio River. 6,400,000 cubic yards of material will be required for the dam embankment and the spillway will have nine gates, each 50 feet wide by 25.6 feet high with the gate sills at elevation 390.0 and the tops of gates at elevation 415.6. The primary purpose of the project is to create a dependable water supply for municipal and industrial use and prevention of flood damage to downstream areas. Fish, wildlife and outdoor recreation will be enhanced. Adverse environmental effects will be: (1) the inundation of 10,000 acres of land for water supply and 6,260 acres of bob white and dove habitat; (2) some family relocations; and (3) temporary noise, dust, and traffic disruptions resulting from construction activities. Alternatives are no action or an alterna-tive dam and reservoir site and reservoir sizes. (Wheeler-Florida)

MINNESOTA RIVER, MINNESOTA, MAN-KATO-NORTH MANKATO-LE HILLIER FLOOD CONTROL, PHASE 1 (FINAL EN-VIRONMENTAL STATEMENT). Army Engineer District, St. Paul, Minn.

Field 08—ENGINEERING WORKS

Group 8D-Soil Mechanics

Available from the National Technical Informa-tion Service as PB-208 294-F, \$3.00 in paper copy, \$0.95 in microfiche. January 18, 1972. 46 p, 2 map, 1 chart.

Descriptors: *Channel improvement, *Flood protection, *Minnesota, *Environmental effects, *Levees, Drainage, Earthworks, Flood control, Floodproofing, River flow, Floods, Vegetation effects, Sedimentation, Turbidity. Identifiers: *Environmental Impact Statements, *Mankato-LeHillier Flood Control (Minn).

The proposed project includes the construction of 25,000 linear feet of levees and 10,000 linear feet of floodwalls, five road relocations, construction or modification of 12 pumping stations, interior drainage facilities, and intermittent ponding along five miles of the Minnesota River. The project will provide relief for the cities of Mankato, North Mankato, and Le Hillier, Minnesota from floods which have a frequency of once in proporties the which have a frequency of once in approximately 80 years. The adverse environmental effects in-volve the stripping of the streambank vegetation, elimination of habitat of small animals in the elimination of nabitat of small alimnas in the riparian zone, a decrease in access and land suitable for undeveloped recreation, condemnation of several residential properties, damage to the corridor ecosystem during construction, and tempora-ry turbidity and increased stream silting during project construction, causing damage to aquatic biota. Alternatives are no action, flood plain regulation, river channelization, upstream reservoir control and comprehensive Soil Conservation Service watershed management. (Wheeler-Florida) W73-01405

GENESEE RIVER BASIN STUDY (DRAFT EN-VIRONMENTAL IMPACT STATEMENT).
Great Lakes Basin Commission, Ann Arbor,

Available from the National Technical Informa-tion Service as PB-207 437-D, \$3.00 in paper copy, \$0.95 in microfiche. March 1972. 22 p.

Descriptors: *Environmental effects, *New York, *Water quality control, *River basin development, Recreation, Bait fishing, Fishing, Recreation demand, Water resources development, Conserva-tion, Irrigation, Water storage, Water supply, Wil-dlife management, Sedimentation, Erosion, Sedi-ments, Municipal water, Industrial water, Rivers, Flood control.

Identifiers: *Environmental Impact Statements, *Genesee River Basin (New York).

A broad, long-range plan is presented to assure the best use of the basin's resources in meeting pro-jected water and related land needs through the year 2020. Structural measures include 16 upland reservoirs in the Genesee River Basin in the Great Lakes region of New York. The principal proiected needs and demands for development are additional outdoor recreation, enhancement of fish and wildlife, supplemental irrigation, municipal and industrial water supply, and water quality management. The control of sediment production management. The control of sediment production and deposition, erosion of streambanks and agricultural lands and flood control were considered. The impact of the environmental resources of the region resulting from the proposed programs and projects are more beneficial than adverse. The project will reduce sediment and improve water quality which will improve productivity of the stream fishery. Adverse effects include the loss of about 7,500 acres of bottomland that the contract of the con and the loss of about 65 miles of free flowing stream. Several alternative structural plans were investigated as well as the alternative of no proinvestigated as well as the alternative of in project. These alternatives would not produce the benefits of the scope and variety of the proposed plan. (Nielsen-Florida) W73-01412

PLAQUEMINE LOCK CLOSURE, MISSISSIPPI RIVER AND TRIBUTARIES PROJECT, IBERVILLE PARISH, LOUISIANA (DRAFT EN-VIRONMENTAL IMPACT STATEMENT).

Available from the National Technical Informa-tion Service as PB-208 298-D, \$3.00 in paper copy, \$0.95 in microfiche. January 1972. 19 p, 1 map, 1

Descriptors: *Louisiana, *Environmental effects, *Flood control, *Locks, Levees, Water levels, Navigation, Coastal marshes, Watersheds (Basins), Water supply, Percolation, Wildlife, Turbidity, Waterfowl, Vegetation, Fish, Sediments, Stagnant water, Runoff, Vegetation effects, Wilhabitats, Aesthetics, Flood protection, Flooding, Borrow pits.
Identifiers: *Environmental Impact Statements, *Iberville Parish (Louisiana), *Plaquemine Lock

The Plaquemine Lock, part of the Mississippi River flood protection system, is located on the alluvial plain of the central gulf coast. Constructed to restore a navigable connection between Bayou Plaquemine and the Mississippi River, the lock has been closed to navigation since 1961. The purpose of the project is to permanently close the lock by constructing an earth levee as part of the Missispip River Flood Control project. The area that would be affected by closure of the lock consists of 3 300 acress presently devoted to sericultural would be affected by closure of the lock consists of 3,300 acres presently devoted to agricultural and mineral production. The proposed project will provide integrity to the Mississippi River levee flood protection system and add security to the area between that river and the Atchafalya Basin. Wildlife resources in this area are substantial and will be afforded protection by stabilization of the elevee system and the current unsightliness of the deteriorated lock will be eliminated. Adverse environmental impacts from the surject will be vironmental impacts from the project will be limited to temporary effects on wildlife and vegetation during construction. Alternatives to the proposed action include the utilization of a concrete wall and earthen embankment across the lock, the use of a closed structure with a gated opening to control runoff flow, and a no-action decision. (Bradley-Florida) W73-01413

MECHANICS OF SOIL EROSION FROM OVER-LAND FLOW GENERATED BY SIMULATED RAINFALL, Colorado State Univ., Fort Collins, Dept. of Civil

Ph D Thesis, May 1972. 183 p, 43 fig, 21 tab, 65 ref. OWRR B-064-COLO (5).

Descriptors: *Soil erosion, *Overland flow, *Impact (Rainfall), *Turbulent flow, *Supercritical flow, Hydraulic models, Simulated rainfall, Model studies, Erosion, Scour, Sheet erosion, Surface runoff, Froude number, Reynolds number.

The mechanics of soil erosion from overland flow generated by simulated rainfall were studied ex-perimentally in a 4 foot-deep, 5 foot-wide and 16-foot-long flume at the Colorado State University Engineering Research Center. Twenty-four runs Engineering Research Center. I wenty-four runs were made with bare sandy soil, using 6 different slopes (5.7 to 40 percent) and 4 different rainfall intensities (1.25 to 4.60 inches per hour). Pour additional runs were made with 40% of soil surface covered by winter wheat. In each run, the sediment yield, mean velocity of flow, water discharge and temperature were measured, and the eroded material was analyzed for grain size distribution. Flow under these conditions cannot be strictly called laminar, but neither is it turbulent. Flow subjected to a continuous series of perturbations such as under raindrop impact appears turbulent and may be called agitated laminar flow. Froude numbers ranged from 0 to 5.4; that is, flow was of the supercritical type. Sediment transport models from dimensional analysis, data analysis and analytical approaches are similar. Velocity, slope and rainfall intensities are the most important variables affecting soil erosion. In sediment transport prediction, the slope and Reynolds number are dominant parameters. Soil loss decreases in the presence of vegetal cover. However, the decrease in soil loss diminished with increasing rainfall intensities. (Knapp-USGS)

SEEPAGE ANALYSIS OF EARTH BANKS UNDER DRAWDOWN, Army Engineer Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 04A. W73-01752

CONSTRUCTION PORE PRESSURE DISSIPA-TION IN EARTH DAMS, Bureau of Reclamation, Denver, Colo.

E. W. Gray, Jr.

E. W. MRS, Jr.
Paper presented at American Society of Civil Engineers, Special Conference on Performance of Earth and Earth-Supported Structures, Purdue Univ., Lafayette, Ind., June 1972. 20 p. 11 fig, 5 tab, 8 ref, 2 append.

Descriptors: "Barth dams, "Pore pressure, Compaction, Dam construction, Dam design, Negative pore pressure, Stress analysis, Piezometers, Instrumentation, Compressed air, Soils, Embankments, Stress, Compression, On-site investigations, "Dissipation, California. Identifiers: "Dissipation, Trinity Dam (Calif.), Gibson method, Hiff method, Compressible soils, Lifts (Construction), Pore air pressure, Pore water

Methods proposed by Hilf and Gibson for estimating construction pore pressures in earth dams were applied to Trinity Dam, a 537-ft-high earth and rockfill structure in Calif. Basic data obtained during construction of the dam were analyzed to compare the 2 methods. Data included pore water pressure in the construction of the dam were analyzed to compare the 2 methods. Data included pore water pressure in the construction of the life. pare the 2 methods. Data included pore water pressure readings, internal compression of 10-ft lifts, construction reports, and results of construction reports, and results of construction control testing. Results indicate that Gibson's method would not have successfully predicted Trinity Dam pore pressures, but in embankments where the soil is compacted at or slightly wetter than optimum water content, the method should yield better results. Hill's method predicted pore pressures closer to measured values; allowance for negative pore pressures would have improved the prediction. (USBR) W73-01784

FINITE ELEMENT ANALYSIS OF STRAIN-SO-FTENING CLAY, Stanford Univ., Calif.

Stathford Class, Stathford Class, Stathford Class, Sournal of the Soil Mechanics and Foundations Division, American Society of Civil Engineers, Vol 98, No SM1, p 43-58, Jan 1972. 8 fig. 39 ref, 2

Descriptors: *Finite element analysis, *Deforma-tion, *Stress analysis, Clays, Analytical techniques, Mathematical models, Soil mechanics, Soil properties, Saturated soils, Bearing capacity, Embankments, Stress-strain curves, Strain hardening, Yield strength, Soils, Numerical analy-sis, Mathematical analysis, Plastic deformation, Bibliographies, On-site tests. Identifiers: *Strain softening, *Progressive Gathward, Stress Deformable, soils Identifiers: *Strain softening, *Progressive failures, Octahedral stress, Deformable soils, Yielding, Computer-aided design.

Strain-softening stress-strain behavior and the resulting progressive-type failure are of concern in many geotechnical engineering problems, but analyses available are limited in scope or are empirical in nature. A review and evaluation were given of analytical stress-strain-strength models applied in soil mechanics, with emphasis on whether the different proposed models could accommodate strain-softening behavior. Using an elastic, plastic model, based on the theory of incemental plasticity, was suggested. Incorporated into a finite element analysis, this general stress-strain-strength model was evaluated and used to determine the undrained load-deformation curve and bearing capacity of a circular foundation. Results from computations with and without plastic strain-softening were compared, and the proposed model was applied to analyze the undrained behavior of a soft clay under a large, instrumented, circular test fill. A dramatic increase in deformations was found for relatively modest strumented, circular test full. A dramatic increase in deformations was found for relatively modest amounts of assumed strain-softening. Because soil engineering designs, based on residual strength determined experimentally under large strains, may sometimes be unrealistic, techniques to estimate deformations must be developed. (USBR)

CONSOLIDATION OF CLAY LAYER IN TWO

CONSULIDATION OF CLAT LATER BY 1700 DIMENSIONS,
Alberta Univ., Edmonton.
S. D. Koppula, and N. R. Morgenstern.
Journal of the Soil Mechanics and Foundations Division, American Society of Civil Engineers,
Vol 98, No SM1, p 79-93, Jan 1972. 11 fig, 16 ref, 2

Descriptors: "Pore pressure, "Consolidation, "Earth dams, Clays, Soil mechanics, Mathematical analysis, Time, Settlement (Structural), Drains, Filters, Dam construction, Dam design, Retardance, Bibliographies, Theoretical analysis. Identifiers: "Cores (Dams), "Pore water pressure, Computer-aided design, Electric analogs, Finite difference method, Dissipation, Pervious blankets."

Terzaghi's one-dimensional theory of consolidation is commonly used for estimating consolidation of clay layers. However, since the conditions
of one-dimensional consolidation seldom occur, a
2-dimensional procedure was developed using a
numerical method—the alternating-direction implicit (ADI) method—and requires about half the
computer storage capacity needed by an explicit
finite difference scheme. The ADI method agrees
well with results from a closed form solution. An
example is given of pore-pressure dissipation for
the impervious core of an earth dam founded on an
impermeable base. For both a half completed and
a completed earth dam, the ADI solutions gave
poor agreement with electrical analog solutions.
The influence of impeded drainage on the dissipation of pore pressure from a rectangular section of
soil was studied. (USBR)

JEFFERSON RIVER AT THREE FORKS, MON-TANA (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Omaha, Nebr.

Available from the National Technical Informa-tion Service as PB-208 296-F, \$3.00 in paper copy, \$0.95 in microfiche. December 1971. 32 p, 1 map.

Descriptors: *Montana, *Levees, *Flood protection, *Environmental effects, Flood control, Ditches, Excavation, Drainage, Flood plains, Flood plain zoning, Flood proofing, Floods, Borrow pits, Land use, Water pollution sources, Channel improvements, Vegetation effects,

Identifiers: *Environmental Impact Statements,
*Three Forks (Mont).

The proposed project involves the construction of an earth filled levee with 10 foot top width and average height of 6 or 7 feet, approximately 14,700

feet in length along the northwest side of Three Forks in Gallatin County, Montana. A small portion of the material for the construction of the levee will be obtained from the excavation of a collector ditch along the landslide of the levee. The bulk of the remaining necessary material will be obtained from alluvium deposits in the river valley or valley slopes. The project will provide protection against a 100-year frequency flood. A potential for wildlife habitat will exist along the collector ditch. Adverse environmental effects include: (1) removal of 28 acres of land from alternative land use, (2) the collector ditch could act as a collector of pollutants, and (3) 500 feet of shelterbelt will be removed causing a temporary reduction in wildlife or postuants, and (3) 500 feet of shelterbelt will be removed causing a temporary reduction in wildlife cover. Alternatives are flood plain zoning, evacua-tion, flood proofing, reservoir construction, chan-nel improvement, and no action. (Wheeler-Plorida)

SMALL BOAT HARBOR, KING COVE, ALASKA (DRAFT ENVIRONMENTAL IMPACT

Army Engineer District, Anchorage, Alaska.

Available from the National Technical Informa-tion Service as PB-208 572-D, \$3.00 in paper copy, \$0.95 in microfiche. March 1972. 36 p, 2 fig, 1 map, 5 photo, 3 tab.

Descriptors: *Alaska, *Environmental effects, *Harbors, *Coastal engineering, Dikes, Groins (Structures), Earthworks, Channels, Lagoons, Bays, Water quality, Navigation, Coastal struc-tures, Aquatic environment, Water pollution. Identifiers: *Environmental Impact Statements, *King Cove (Alaska).

This small boat harbor project in King Cove, Alaska, is designed to provide protected anchorage for vessels during off-season and during foul weather. The plan of development consists of a 1250 foot earth fill training dike, a 210 foot rock groin, a 400 foot dredged entrance channel and an 11-acre anchorage basin. King Cove, located on the mountainous side of the Alaska Peninsula, is approximately two miles long and one mile wide. The most striking biological feature of the area is the immense number and variety of of the area is the immense number and variety of birds. The major environmental impact categories associated with the harbor project are: harbor construction, quarry operation and water quality. Adverse environmental effects include: loss or alteration of 23.8 acres of the marine habitat, temporary increase in water turbidity, long-term degradation of water quality within the harbor, and decreased circulation and low level chronic pollution. Four alternate harbor sites were eliminated because of alternate harbor sites were eliminated because of high initial costs, excessive construction material quantities, high maintenance costs and lack of significant difference in environmental impact. No development and an alternate quarry site were also considered. The proposed project would require the removal and use of approximately 11,000 cubic yards of quarry rock. (Crow-Florida) W73-01904

CHINA MEADOWS DAM AND RESERVOIR, LYMAN PROJECT, WYOMING (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Bureau of Reclamation, Salt Lake City, Utah.

Available from the National Technical Informa-tion Service as EIS-WY-72-4582-F-1, \$9.50 paper copy, \$0.95 in microfiche. May 19, 1972. 149 p, 3 map, 2 photo, 8 append.

Descriptors: *Environmental effects, *Wyoming, *Dam construction, *Reservoir construction, *Flood protection, Earth dams, Flood control, Priodo protection, Earth dams, Priodo Control, Watershed management, Water storage, Irrigation water, Aesthetics, Engineering structures, Stream stabilization, Stream fisheries, Wildlife habitats, Flood irrigation, Earthworks, Dikes, Diversion structures, Irrigation systems. Identifiers: *Environmental Impact Statements. *Mountain View (Wyoming).

The proposed project involves construction of a 106 foot earth fill dam and dike, creation of a 372 acre reservoir, and subsequent operation of the project. The damsite is located in Utah about 25 miles south of Mountain View, Wyoming. The proposed action would have a stabilizing effect on the downstream flows, reduce floods from high spring runoff, provide higher summer flows for extended irrigation and preserve stream fisheries during the nonirrigation season. Adverse environmental effects are the inundation of 372 acres of meadow and forest, which will result in the loss of two miles of trout stream, 205 acres of timber, fall two miles of trout stream, 205 acres of timber, fall forage for elk, moose, deer, and campground sites; the reduction of the area's aesthetic quali-ties; and the elimination of 30 acres of wildlife habitat from the construction of an access road No alternatives are considered feasible. Included are comments by interested government agencies.
(Beardsley-Florida)
W73-01909

DEQUEEN LAKE, ROLLING FORK RIVER, ARKANSAS (FINAL ENVIRONMENTAL IMPACT STATEMEN). Army Engineer District, Tulsa, Okla.

Available from the National Technical Informa-tion Service as EIS-AR-72-4555-F, \$16.25 in paper copy, \$0.95 in microfiche. January 7, 1972. 239 p, 15 fig, 4 map, 14 photo, 41 tab, 9 append.

Descriptors: *Environmental effects, *Flood control, *Arkansas, *Multiple-purpose projects, Water supply, Dams, Dikes, Earthworks, Embankments, Structures, Recreation, Spallways, Water quality, Land management, Dry beds, Water quanty, Land management, Dry beds, Reservoir storage, Retention, Water storage, Channel improvement, Flood plain zoning, Flood plain insurance, Flood proofing, Werning systems, Flood damage. Identifiers: "Environmental Impact Statements, "Rolling Fork River (Ark), "DeQueen Lake (Ark).

The project is located in Sevier County, Arkans near the Oklahoma border on the Rolling Fork River. Action consists of completion of the main embankment (dam), dikes, service bridge, reser-voir clearing, spillway and bridge, and recreation facilities. The project is one unit of a comprehen-sive and integrated system contributing to the development of the Little Piece. Projection development of the Little River Basin and the Red River below Denison Dam, Texas. DeQueen Lake (project) will be operated for water supply, water quality, fish and wildlife, recreation, and flood control purposes. Although there are no immediate water supply users in the area, local water districts have furnished assurance of full use. Land utilization downstream will be increased as a result of the project. The conservation pool will per-manently inundate 1,680 acres of land which will affect aquatic and terrestrial species now living there. Twelve archeological sites will be affected by the lake waters, and several families have been relocated. Alternatives considered since the passage of the National Environmental Policy Act include: a dry lake, enlargement of Millwood Lake, upstream retention lakes, levees, channe improvement, flood plain management (flood plain zoning, flood insurance, evacuation, early warning floodproofing) and no action. Extensive coordina-tion with others was effected. (Nielsen-Florida) W73-01914

TUALATIN PROJECT, OREGON (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Bureau of Reclamation, Boise, Idaho. Region 1.

Available from the National Technical Informa-tion Service as PB-199 327-F, \$3.00 in paper copy, \$0.95 in microfiche. April 25, 1972. 70 p, 1 map.

Field 08-ENGINEERING WORKS

Group 8D-Soil Mechanics

Descriptors: "Environmental effects, "Oregon, "Reservoir construction, "Dam construction, Irrigation systems, River basin development, Earth dams, Fish management, Fish conservation, Reservoirs, Pumping plants, Fish ladders, Rivers, Multiple-purpose reservoirs, Dams, Irrigation programs, Irrigation, Flooding. Identifiers: "Environmental Impact Statements, Tualatin River (Oregon).

Tualatin River (Oregon).

The Tualatin River (Oregon).

The Tualatin River (Oregon).

The Tualatin River (Oregon).

The Tualatin River (Oregon).

The Tualatin River (Oregon).

The Tualatin River and two pumping plants. Fish trapping and holding facilities and a fish ladder on an existing dam will also be constructed. The Tualatin Project area presently consists of sloping hillsides and bottom lands. The Tualatin River and its tributaries support numerous fish and wildlife, although the area does not have any developed recreation facilities. Environmental impacts and adverse environmental effects include: blocking of about 15 miles of potential fish spawning area by the earthfill dam; nundation of about 4 miles of spawning areas by the Reservoir; inundation of about 1,100 acres of private lands; increase in waterfowl resting areas due to the construction of the reservoir; relocation of 12 miles of roads and 8 miles of power lines; a possible loss of trout fishery as they pass through high pressure valve outlet works; and enhancement of water quality and fisheries below the reservoir. Construction of the fish ladder will aid fish migration, and fish losses will be mitigated by the fish trapping and holding facilities. Alternatives considered included: no project, single-purpose groundwater irrigation pumping project, and a multipurpose dam and reservoir on the Tualatin River. Irretrievable commitments include riparian vegetation which provides habitat for upland will diffe and 69 acres of merchantable timber which will be removed. (Crow-Florida)

W73-01947

8E. Rock Mechanics and Geology

SOLUBILITY CHARACTERISTICS OF ROCKS, SOILS, AND MUD (GORNYTE, POCHVEN-NYTE I ILOVYTE RASTVORY), Akademiya Nauk SSSR, Novosibirsk. Institut Neorganicheskoi Khimii. For primary bibliographic entry see Field 02G. W73-01325

COMMON FEATURES OF THE RESERVOIR-A-SSOCIATED SEISMIC ACTIVITIES, National Geophysical Research Inst., Hyderabad For primary bibliographic entry see Field 04A.

SOME DISCRIMINATORY CHARAC-TERISTICS OF EARTHQUAKES NEAR THE KARIBA, KREMASTA, AND KOYNA ARTIFI-CIAL LAKES, National Geophysical Research Inst., Hyderabad For primary bibliographic entry see Field 04A. W73-01738

8F. Concrete

NONLINEAR STRESS ANALYSIS OF REIN-NUNLINEAR STRESS AND TABLE 33 OF BEAUTON CONCRETE, New South Wales Univ., Kensington (Australia). S. Valliappan, and T. F. Doolan. Journal of the Structural Division, American Society of Civil Engineers, Vol 98, No ST4, p 885-898, Apr 1972. 11 fig. 15 ref, 2 append. Descriptors: *Stress analysis, *Reinforced concrete, *Concrete structures, Bibliographies, Structural analysis, Cracks, Tensile properties, Beams (Structural), Reinforcing steel, Mathematical models, Concretes, Creep, Shrinkage, Structural design. cal models, Concretes, tural design. Identifiers: *Crack Elastoplasticity, Nonlis ment method, Hinges. propagation, Bond, near properties, Finite ele-

A 2-dimensional finite-element analysis to determine the stress distribution in reinforced concrete structures is presented. The analysis includes the elastoplastic behavior of steel and concrete and the limiting tension criterion for concrete. The nonlinear problem is solved in several linear sequences and introduces the effect of nonlinearities in material behavior by a stress transfer process. Results of the numerical examples are compared with available solutions. A nonlinear analysis is necessary for realistic stress distribution in reinforced concrete structures because of the redistribution of stresses resulting from progressive cracking of concrete. This analysis does not consider the effect of bond between steel and concrete or the influence of concrete creep and shrinkage. Analyses of reinforced concrete hinges, haunches, and beams are exemplified. (USDR) hinges, (USBR) W73-01777

ADVANCES IN NONDESTRUCTIVE TESTING OF CONCRETE, South Dakota School of Mines and Technology,

South Dawy Rapid City. S. T. Li, V. Ramakrishnan, and J. E. Russell. Highway Research Record, No 378, p 1-11, 1972.

Descriptors: "Nondestructive tests, "Concrete tests, Concrete technology, Quality control, Concretes, Modulus of elasticity, Strength, Instrumentation, Electrical equipment, Radioactivity techniques, Bibliographies, Concrete properties, Concrete structures.

Concrete structures.

Identifiers: *Test equipment, Pulse velocity tests,
Resonance frequency method, Ultrasonic tests,
Microstructure, Hardness tests, Sonic velocity

Recent advances in nondestructive methods of testing concrete are reviewed: ultrasonic, resonance, radioactive, electrical, initial surface absorption, chemical analysis, and hardness. Of all these techniques, the ultrasonic method is potentially the most useful for assessing concrete quality. Ultrasonic testing can be used successfully in the role of troubleshooter when faulty workmanship is discovered or is suspected in concrete construction. It may also prove superior to traditional methods for 2 other major uses: (1) quality control in the construction of structural members; and (2) monitoring strength development to determine acceptable times for removing formwork or the transfer of prestressing force to the concrete. Ultrasonic testing provides an opportunity to test concrete in place; test zones can be chosen for their critical importance in having to resist the highest stresses. One of the greatest problems in applying nondestructive testing techniques is lack of education in this field. Most engineers working with concrete are trained in civil engineering and do not have the background to use ultrasonic, electrical, or nuclear equipment. (USBR) Recent advances in nondestructive methods of

8G. Materials

CORROSION AND THE WATER SUPPLY EN-Corrosion Association. Victorian Branch. Branca. F. L. Burns. Australian Chemical Processing and Engineering, Vol 25, No 5, p 21-24, May 1972.

Descriptors: *Metal pipes, *Corrosion control, *Electric potential, Electrolytes.
Identifiers: *Corrosion theory.

Identifiers: *Corrosion theory.

Thinking of corrosion phenomena in terms of a completed electrical circuit with a cathode coanceted to an anode (the corrosion point) by an electrolyte will aid the water supply engineer in understanding previous solutions and creating new solutions to 99.9% of his corrosion problems. Most mild steel corrosion prevention is in the form of moisture insulation (breaking the circuit). Coating material and thickness depend on the service required. Rearranging the electric potential may employ a high potential sacrificial material which becomes the anode. A zinc-rich paint, hot dip galvanizing, or a separate block of zinc may be used, but complete electrical contact must be maintained. If stray ground currents are minimized, an external current may be applied to reverse potentials. In applying these solutions, the problems of differential aeration and dissimilar metal contact must be anticipated, but these are better dealt with in design than in maintenance. (Anderson-Texas) W73-01374

WATER TREATMENT SYSTEM, For primary bibliographic entry see Field 05F. W73-01847

8H. Rapid Excavation

TRED AVON RIVER, TALBOT COUNTY, MARYLAND (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Baltimore, Md.

Available from the National Technical Informa-tion Service as EIS-MO-72-4490-D, \$3.00 in paper copy, \$0.95 in microfiche. April 1972. 13 p, 3 map, 1 tab.

Descriptors: *Maryland, *Environmental effects, *Channel improvement, *Dredging, Navigation, Spoil banks, Channels, Stream improvement, Turbidity, Sitiation, Wildlife habitats, Besthos, Oysters, Boats, Ships, Transportation, Aquatic environment, Economic impact, Basins, Rivers. Identifiers: *Environmental Impact Statements, *Talbot County (Maryland).

This project involves dredging a channel in Maryland's Tred Avon River from near Peachblossom
Creek to Easton Point, a channel about 1400 feet
long in the North Fork, and a turning basin in the
South Fork on the east side of the main channel at
Easton Point. The 430,000 cubic yards of spoil
material will be deposited in seven nearby disposal
sites. The channels will provide for more efficient
vessel operation. More waterborne commerce,
especially shipments of slag and fertilizer, may
also be generated. Adverse environmental impacts
include loss of some wildlife habitat, cropland,
and trees on the 90 acres of diked disposal areas;
disruption of the bottom sediment of the river with
loss of bottom organisms in the zone of dredging;
loss of two oyster bars totaling 45 acres; and shortterm turbidity and siltation. Alternatives considered were foregoing action, use of other than term intoluty and statuous. Anternatives con-sidered were foregoing action, use of other than water transportation, providing a 14 foot deep channel, or alternate methods of spoil disposal. (Ellis-Florida) W73-01398

BREAKAGE OF FLOATING ICE BY COM-PRESSED GAS BLASTING. CC BY COM-PRESSED GAS BLASTING. Cold Regions Research and Engineering Lab, Hanover, N.H. For primary bibliographic entry see Field 04A. W73-01460

Preparation of Reviews—Group 10F

81. Fisheries Engineering

POPULATION DYNAMICS OF THE COHO SALMON AND ITS RESPONSE TO LOGGING IN THREE COASTAL STREAMS, Oregon State Univ., Corvallis. For primary bibliographic entry see Field 05G. W73-01426

OYSTER HATCHERIES FOR THE CHES-APEAKE BAY REGION, Maryland Univ., Solomons. Natural Resources Inst.
H. Hidu, K. G. Drobeck, E. A. Dunnington, Jr.,
W. H. Roosenburg, and R. L. Beckett.
Available from the National Technical Information Service as COM-72-10391, \$3.00 in paper copy, \$0.95 in microfiche. Natural Resources Institute, Special Report No 2, Contribution No 382, March 1969. 18 p, 10 fig. 3 tab, 29 ref.

Descriptors: *Oysters, *Spawning, Larvae, Economic feasibility, Chesapeake Bay. Identifiers: *Hatcheries, *Commercial production, *Biological feasibility, Larval rearing, Spat handling, Spat, Literature review.

handling, Spat, Literature review.

The development of hatchery rearing methods for commercial production of the American oyster, Crassostrea Virginica, in the Chesapeake region is discussed. Consideration is given to workable methods of (1) conditioning and spawning, (2) larval rearing, and (3) spat handling of Chesapeake oyster stocks. Chesapeake and Delaware Bay oyster stocks have been successfully and repeatedly conditioned in the laboratory to produce gametes through much of the season. Thus, hatchery spawning of oysters no longer poses a problem. Larval feeding systems using cultured algae have proved workable on an experimental scale, while inexpensive and natural algal feeding systems have proved successful over a great range of Chesapeake salinities. Spat rearing methods have been tested in low salinity settings with generally high growth and survival rates due to the lack of disease and predators in these areas. Consequently, commercial shellfish hatcheries appear to be biologically feasible in the Chesapeake area. However, the potential economic benefits of commercial hatcheries to the Bay area remain to be analyzed. Also, the relationship of hatcheries to natural seed production methods needs to be clarified. (Settle-Wisconsin)

AQUACULTURE: A NEW ENGLAND PERSPEC-TIVE.

Rhode Island Univ., Narragansett. New England Marine Resources Information Program.

For primary bibliographic entry see Field 06C.

W73-01799

A TECHNOLOGICAL PERSPECTIVE, For primary bibliographic entry see Field 06C. W73-01800

FEEDING OF CATFISH CLARIAS LAZERA IN EXPERIMENTAL PONDS, A.E. Imam, H. M. Roushdy, and A. Philisteen. Bull Inst Oceanogr Fish. 1: p 205-222. 1970. Illus. Identifiers: "Catfish, Clarias-Lazera, "Feeding habits (Fish), Ponds, Fish.

Attempts were made to determine a suitable artificial food for C. lazera reared in experimental ponds. The nutritive values of the feeds were tested. The first was exclusive animal matter composed of minced fresh forage fish meat. The other 2 diets were of exclusively plant matter; one formed of rice bran and the other of fresh vegeta-

bles. The nutritive values of the different experimental diets were chemically investigated. The nutritive efficiency of each diet was then estimated on the basis of the change in rate of growth of fed animals as well as the rate of added weight. Fresh forage fish meat was the most suitable diet for C. lazera. It provided the fish with an abundant protein supply and had the necessary dietary essentials to promote growth. The higher efficiency of this diet was shown by better growth rate, greater weight addition as well as by better halt condition of the fish.—Copyright 1972, Biological Abstracts, Inc.

W73-01875

TUALATIN PROJECT, OREGON (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Bureau of Reclamation, Boise, Idaho. Region 1. For primary bibliographic entry see Field 08D. W73-01947

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER, WATER RESEARCH SUMMARY.
Oregon State Univ., Corvallis. Water Resources
Research Inst.

June 1972. 161 p. OWRR A-999-ORE (13).

Descriptors: "Water resources institute, "Projects, "Universities, "Oregon, "Reviews, Planning, Watershed management, Water supply, Water quality, Water conservation, Ecology, Water pollution control, Water utilization, Groundwater, Environmental effects, Water resources development, Water demand, Water yield, Hydrology, Surface waters. Identifiers: "Oregon State University.

A listing of research facilities and current projects at Oregon State University covering water-related subjects is presented. Also included are water-related research projects sponsored by the Water Resources Research Institute (WRRI) at other universities in Oregon. The projects are divided into three general categories: Water Resources Planning and Management, Water Supply and Augmentation, and Water Quality Evaluation. This volume is the fourth summary of WRRI projects in Oregon. The WRRI was established at Oregon State University in 1960 by the State Board of Higher Education. It is designed to foster, encourage, and facilitate research and education related to all factors which affect the quantity and quality of water available for beneficial use. Membership includes personnel on campus who are engaged in water resources research and teaching, as well as those from other institutions of higher learning in the state who participate in the Institute's program. There are about 200 gradues students engaged in water-oriented programs in approximately 20 member departments. (Woodard-USOS)

9D. Grants, Contracts, and Research Act Allotments

WATER, WATER RESEARCH SUMMARY. Oregon State Univ., Corvallis. Water Resources Research Inst. For primary bibliographic entry see Field 09A. W73-01509

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition AND Processing

RESEARCH SUPPLEMENT TO JOURNAL WATER POLLUTION CONTROL FEDERA-TION. Water Pollution Control Federation, Washington, D.C. For primary bibliographic entry see Field 05G. W73-01635

10B. Reference and Retrieval

EVALUATION OF FLARED OUTLET TRANSI-TIONS; HYDRAULIC MODEL INVESTIGA-TION, Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Div. For primary bibliographic entry see Field 08A.

10C. Secondary Publication AND Distribution

DELAWARE NATURAL RESOURCES INVEN-TORY, WITH SELECTED REFERENCES. Delaware State Planning Office, Dover. For primary bibliographic entry see Field 67C. W73-01297

STATE WATER RIGHTS LAWS AND RELATED SUBJECTS: A SUPPLEMENTAL BIBLIOGRAPHY, 1999 TO MID 1967.
Economic Research Service, Washington, D.C. For primary bibliographic entry see Field 06E. W73-01389

ICE SHELVES OF ANTARCTICA (SHEL'-FOVYYE LEDNIKI ANTARKTIDY), Articheskii i Autarticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR). For primary bibliographic entry see Field 02C. W73-01520

TOXIC SUBSTANCES LIST, 1972 EDITION. National Inst. for Occupational Safety and Health, Rockville, Md. For primary bibliographic entry see Field 05B. W73-01631

PCB AND OTHER INDUSTRIAL HALOGENATED HYDROCARBONS IN THE ENVIRONMENT,
Fisheries Research Board of Canada, St. Andrews (New Brunswick).
For primary bibliographic entry see Field 05B.
W73-01897

10F. Preparation of Reviews

FOREST FERTILIZATION (A STATE-OF-T-HE-ART REVIEW AND DESCRIPTION OF EN-VIRONMENTAL EFFECTS), Pacific Northwest Water Lab., Corvallis, Oreg. For primary bibliographic entry see Field 05C. W73-01638

Field 10-SCIENTIFIC AND TECHNICAL INFORMATION

Group 10F-Preparation of Reviews

STRUCTURAL SAFETY-A LITERATURE REVIEW.
American Society of Civil Engineers, New York.
Task Committee on Structural Safety.
For primary bibliographic entry see Field 08A.
W75-01778

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- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

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- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources
 of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows, at the Department of Agricultural Engineering of Colorado State University.

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- WATER SUPPLY AUGMENTATION AND CONSERVATION
- WATER QUANTITY MANAGEMENT AND CONTROL
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